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**Solving a Sunken Mystery: The Investigation and Identification of a
Sixteenth-Century Shipwreck**

By

Corey Malcom

**A thesis submitted to the University of Huddersfield
in partial fulfilment of the requirements for the degree of
Doctor of Philosophy**

**The University of Huddersfield
School of Music, Humanities, and Media**

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ABSTRACT

In the summer of 1991, St. Johns Expeditions, a Florida-based marine salvage company, discovered a shipwreck buried behind a shallow reef along the western edge of the Little Bahama Bank. The group contacted archaeologists to ascertain the significance of the discovery, and it was soon determined to be a Spanish ship dating to the 1500's. The investigation of the shipwreck was entrusted to the author, working for the Mel Fisher Maritime Heritage Society (MFMHS), a not-for-profit research center based in Key West, Florida. Under the agreement, the collection of recovered materials will remain as an intact collection housed in both Key West and The Bahamas.

Between 1992 and 1999, the MFMHS conducted six excavations to examine and document the shipwreck. Approximately 1,500 artifacts were recovered, along with many more olive jar sherds, iron fasteners, and barrel hoop fragments. Careful analysis of the materials found on the shipwreck, along with clues provided by the remains of the ship itself, shows that the sizeable vessel sailed between 1555 and 1575 and had touched at *Tierra Firme* (Colombia and Panama) before sinking during a return voyage to Spain.

By comparing the archaeological evidence to the historical record, it becomes clear that the St. Johns shipwreck can be none other than the *Santa Clara*, a 300-ton *Carrera de Indias* trader owned by the famed Spanish mariner Pedro Menéndez de Avilés. While returning to Spain in October of 1564, it grounded on a reef in the western Bahamas and could not be freed. Its cargo of silver and the people on board were safely removed to an accompanying ship, and the *Santa Clara* was abandoned.

Santa Clara comes from a time when the Spanish colonial system had largely shifted from the exploration and conquest of the Americas into a new stage of settlement and commercial development. The physical remains of the ship, combined with its history, reveal a material culture in use as the Americas began to be systematically exploited, as well as the sorts of people who sailed with these ships and what they were doing. With the identity and specific circumstances of the shipwreck now known, it can serve as an important touchstone in the understanding of the early Spanish colonial system.

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The St. Johns shipwreck project has been conducted under the auspices of the government of The Bahamas, and the fieldwork was ably monitored and administered by Mrs. Maureen Wilson of the Ministry of Transport, Mr. Mark Edgar of the Ministry of Finance, and Dr. Grace Turner of the Department of Archives. Petty Officers Leslie Forbes, Derek Richardson, Whitfield "O.B." Neely, and Rupert Flowers of the Royal Bahamas Defence Force served as field representatives. Dr. Keith Tinker, Dr. Michael Pateman, and Ms. Kim Outten-Stubbs of The Bahamas Antiquities, Monuments, and Museums Corporation have followed the post-fieldwork progress of the project. All have ensured that this research has followed and met the standards of the government of The Bahamas.

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Chapter 1: LITERATURE REVIEW

Spain's New World Connections

When Christopher Columbus encountered the Americas in his trans-Atlantic crossing of 1492, he was in search of the riches of the orient. After many successive voyages of continued exploration, it became clear that though the Americas were not Asia, they were very fruitful lands. Systems were quickly set in place by the Spanish Crown to not only continue to explore, but to also exploit, the New World. After large, powerful Native kingdoms such as those of the Aztecs in Mexico and the Incas in Peru fell under Spanish influence, much of Central and South America were opened to exploitation. Lands were divided amongst the conquerors, native peoples became vassals, and vast mineral and agricultural wealth was harvested. This bounty led to systems organized to not only take advantage of the situation, but to keep it under Spanish control, as well. Much of this colonial structure was dependent on a steady, connective stream of ships sailing between Spain and the Americas.

The Spanish shipping route between the Old and New Worlds was commonly called the *Carrera de Indias*, or the Indies Route, and though many minor ports were also involved, the substantial wealth discovered in South America and Mexico soon led to the ports of Cartagena, Nombre de Dios, and Veracruz becoming the most important destinations in the route, while Havana served as an almost necessary final stop for ships to find provisions and make necessary repairs before the long Atlantic crossing (McAlister, 1984). The *Carrera de Indias* served as a way for Spanish ships to carry an assortment of European goods to eager colonists and to then return laden with American treasures and agricultural products. The ships also transported a wide variety of people, traveling for many different reasons, in both directions between Spain and the colonies.

The *Carrera de Indias* was divided into two primary routes (Parry, 1996: 134; Peterson, 1975:62). In the *Tierra Firme* route, ships called at Cartagena (in today's Colombia) and Nombre de Dios (Panama) on the South American Caribbean coast. These ports served as entry points for vast areas of the Spanish empire. From Cartagena, people and goods came and went from further afield by utilizing the rivers and trails that penetrated the interior of the north-western portions of South America. Nombre de Dios was linked to South America by an overland route across the isthmus to the City of Panama. From Panama, ships sailed to ports along the western coast, especially in Peru. The other oceanic track within the *Carrera* was called the *Nueva España* route, where ships sailed from Spain to Veracruz and linked with the important commercial systems of Mexico. Much like at Panama, there were overland routes from

Veracruz, Mexico City, and the western port of Acapulco, which, from 1565, linked with ships sailing across the Pacific Ocean to the far-flung Spanish colony at Manila (Schurz, 1939:22).

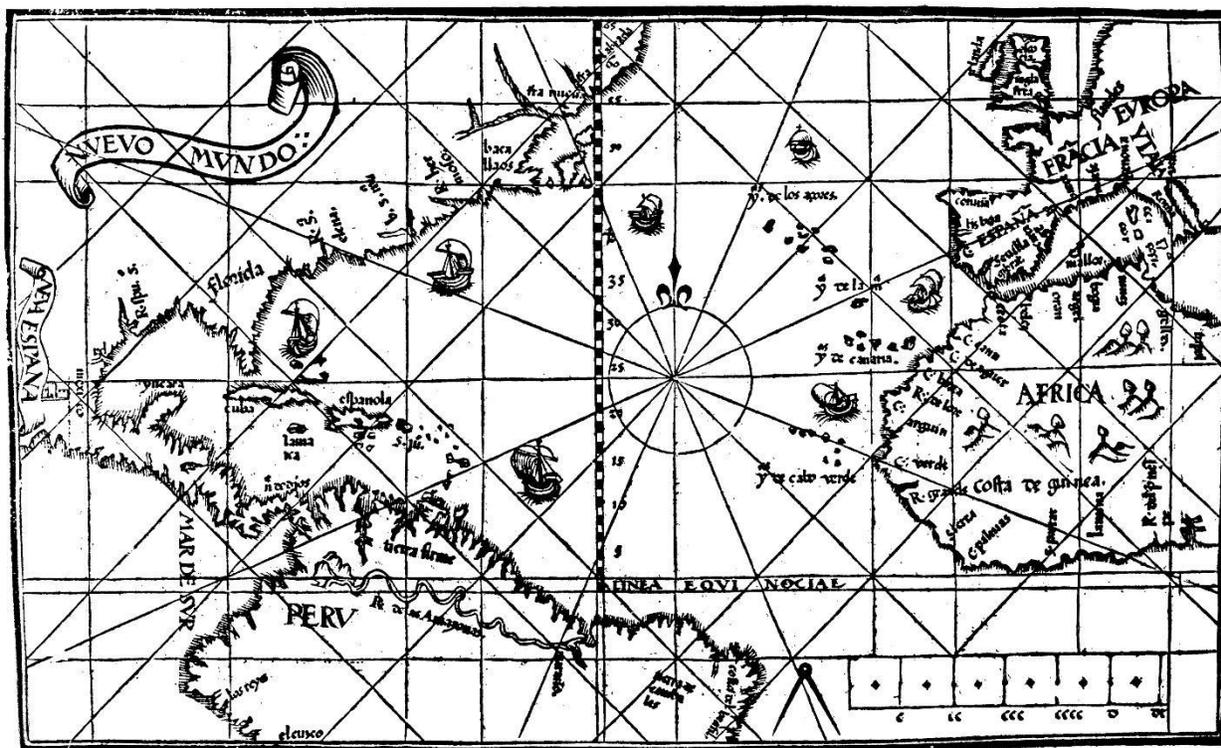


Figure 1.1. *Nuevo Mundo*, showing the general circuit travelled by ships of the *Carrera de Indias*. (From Pedro de Medina, *Arte de Navegar*, 1545, f.6 British Library, London).

The ships of the *Carrera de Indias* were overseen by the *Casa de Contratación*, or House of Trade. The *Casa* was established at Seville in 1503 to administer the commercial enterprises and maritime affairs of the New World (Lamb, 1992:111). Its Seville headquarters became the clearinghouse for goods leaving and entering Spain to and from the Americas. The *Casa* also over saw the licensing of ships and passengers, the training of pilots, and the collection of navigation data from the many assorted voyages. Closely linked with the *Casa*, was the *Consulado*, or *Universidad de Mercaderes* [University of Merchants] a business guild established in 1543, to represent the interests of those people conducting shipboard trade with the Indies (Herrera, 2004:163).

As a way of centralizing governmental affairs of the Indies, the Crown established *El Real y Supremo Consejo de Las Indias*, or the Royal Council of the Indies, in 1524 (Olson, 1992:211). The Council of the Indies answered only to the Monarch. The Council oversaw the regional governments, or *Audiencias*, established throughout the Indies. The members of the Council also worked closely with the *Casa de Contratación* to legislate and resolve issues common to both bodies.

The ships that plied the Atlantic to and from the Indies were largely privately-owned vessels organized by individuals or companies and sailing under the license of the Crown, though there were royally-owned ships, too. Commonly, Indies ships conducted business on behalf of both individuals and the Crown, despite ownership. In any case, to make money, the owners of the ships charged freight and passenger fees and/or carried goods to sell at either terminus of the voyage (Haring, 1918:269; Pérez-Mallaína, 1998:93-95).

The Shipwreck

In the summer of 1991, a shipwreck was discovered on the Little Bahama Bank by the Florida-based shipwreck salvage group St. Johns Expeditions. The men of St. Johns Expeditions were uncertain of the meaning of their discovery and called archaeological and historical consultants to assist them. This writer, representing the Mel Fisher Maritime Heritage Society (MFMHS) of Key West, Florida, visited the site shortly after its discovery to provide an assessment. Based on the collection of artillery and other artefacts that had been uncovered, it was quickly determined that the wreck was almost certainly Spanish and dated to the sixteenth century. St. Johns Expeditions and the government of The Bahamas entrusted the MFMHS with the archaeological study of the shipwreck.

Formal excavation of the “St. Johns” wreck commenced in May of 1992, and continued across the next seven years. Subsequent research revealed the vessel, with a large number of olive jars and other Andalusian ceramics, to undoubtedly be Spanish. Coins provided a *terminus post quem* of 1555, and based on the presence of other artefacts – wrought-iron guns, crossbows, and later Medieval ceramic varieties – which were nearing the end of their popularity by mid-century, it is most likely that this ship wrecked within a decade or two after that date. The presence of a variety of American goods indicates the ship had made contact somewhere in the New World. Significantly, the wreck is located along the edge of the northward flowing Gulfstream current; the major maritime “highway” for the return voyage in the circular *Carrera de Indias*. All told, this evidence indicates the ship was a mid-century, Spanish intercontinental trader returning to Spain while carrying people and goods across the Atlantic.

The study of this shipwreck will yield insights into the material culture and mechanics of the period of early colonization, when Spain’s efforts began to shift from exploration of the American colonies, to the development, management, and utilization of them. It was at this time, the middle decades of the sixteenth century, that the systematic commercial development of the Caribbean, Central America, and South America began to take effect (Parry, 1966; Kamen, 2003). New World mining, agriculture, and

minor industries began to take shape. Dependence shifted from Spain-based to colony-based. A steady pattern of European manufactured goods sailed west, while bounties of silver, gold, and other American goods sailed east. These colonial enterprises were linked to the motherland by ships, and it was this maritime lifeline that allowed Spain to prosper.

With the discovery of the St Johns Bahamas Wreck, a long-lost shipwreck suddenly sprung from the ocean floor. But it did not enter the world in a vacuum of knowledge about sixteenth-century ships and material culture. Historians have also explored the contemporary Spanish documents to distill the essence of these ships. And perhaps most relevant to an understanding of the St. Johns Bahamas Wreck, there have been a number of archaeological studies of shipwrecks that were contemporary, or nearly so, to the St. Johns Wreck.

Primary Sources

Many shipping-related documents exist from the period of the St. Johns Wreck. These are original letters, manifests, and other official papers relating to the outfitting and operation of the Indies fleets. The majority of these documents are currently housed in the Archivo General de Indias, in Seville, Spain. The government of Spain provides information about the documents, in a searchable format, via the internet (*Ministerio de Cultura*, 2016). In addition, many of these documents have been scanned, and the images are readily available for download from the website. The documents also reveal how Spain's transatlantic ships also served as home, workplace, and fortress for people. They were places where people ate, slept, and engaged in any number of other activities that would be found in any small community. The ships were designed to transport goods, people, and information, and they were self-sufficient communities. These ships also sheltered people against the marine environment protected them against enemies.

Both general and specific insight can be gotten by looking at the regulations of transatlantic shipping. These laws represent what was considered the ideal for these ships. By the third quarter of the sixteenth century, the fleet system became more organized, with regular routes and prescribed sailing dates. In a 1564 decree, King Philip II (1564c [1984]) ordered that two fleets a year would sail for the Americas: one for Mexico in April, and one for South America in August. These ships were to carry the necessary supplies, armaments, and crew. They were to call only at authorized ports and could not trade their cargoes at any other place. Under this decree, the king ordered that all ships would be inspected for compliance before departure and after their return.

A series of more specific laws were issued over the years by the crown and by the *Casa de Contratación* (House of Trade), the body that oversaw the system of exploration and colonization of the New World (1647). These laws covered the trade between Spain and the colonies and the operation of the ships that sailed between the two. They oversaw the construction of ships and the organization of crews. Some of the laws were implemented in the sixteenth century and never updated. Of particular interest are those in *Ley XXX*, which outlines the numbers of crew and equipment for vessels of different sizes. This particular regulation also specifies in detail the weapons each was to carry: numbers of bronze and wrought-iron guns are listed, along with harquebuses, crossbows, pikes, lances, armor, and the quantities of powder and projectiles for each type of weapon. The law was first implemented in 1535, reaffirmed in 1563, and again, unchanged, in 1572, offering an image of what the Spanish government considered to be the ideal way to arm and staff an ocean-going ship through much of the sixteenth century.

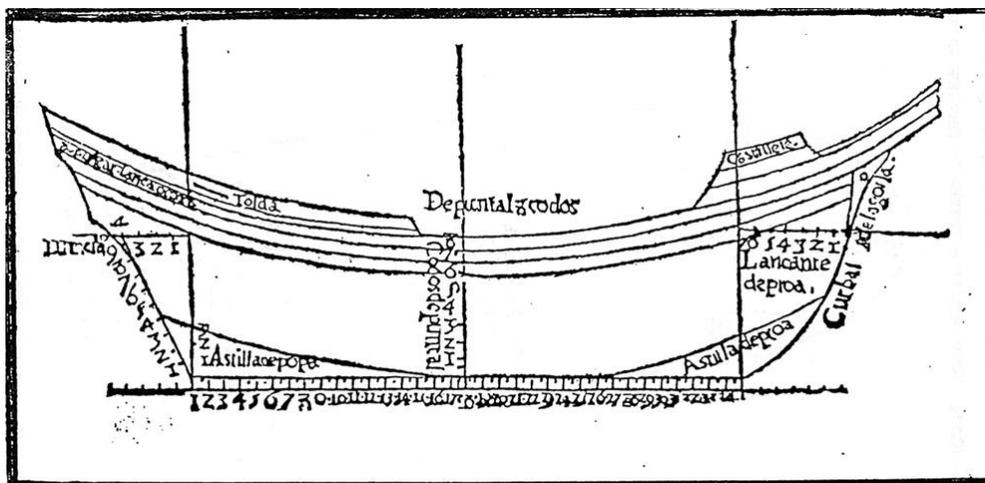


Fig.1.2. Plan view of a 150-ton ship. Diego García de Palacio (1587 [1993]: 280).

The 1587, *"Instrucción Náutica"* written by Diego García de Palacio (1587) is perhaps the single-most important contemporary source for understanding Spanish shipping and maritime operations during the sixteenth century. With topics ranging from the construction of ships to the serving of meals, the volume serves as a comprehensive guide for ship-related matters.

García writes in the form of a dialogue between an instructor and his student. The student asks questions and the instructor provides detailed answers. There are detailed explanations of the use of the prevailing navigational instruments of the day, including the mariner's astrolabe. The necessary

calculations are explained for determining the movements of the stars, and tables for determining the declination of the sun, an important measure in determining latitude, are included, too.

García devotes a section of his book to the construction of sailing ships. He explains the proper proportions for the vessels, the sizes of various sails, and how the ships should be rigged and equipped. The manning of the vessels is another crucial part of the maritime world, and García explains the different positions necessary for the functioning of a ship and the specific duties required of each of these roles.

The *Instrucción Náutica* concludes with a dictionary of nearly sea-terms in use on Spanish ships in the sixteenth century. It offers definitions for structures of the ship, weather terms, equipment, and activities common on board a ship. This important work was reprinted by Spain's Museo Naval in 1993. The *Instrucción Náutica* was also translated into English by the American maritime historian J. Bankston (1987), and this volume can be useful, but García's original words offer the truer sense of the subject.

Historians also organized compilations of Spanish archival documents and published the transcribed, or translated, collections for reference. The nineteenth-century Spanish maritime scholar Caesáreo Fernández Duro transcribed documents covering a wide variety of ship-related subjects from across Spain's colonial period and published them in the six-volume set *Disquisiciones Náuticas* (1876-1881). This work became the basis for a later, exhaustive, nine-volume history of Spain's maritime history from the late fifteenth century on titled *Armada Española* (1895-1903). For English readers, the historians J.H. Parry and R.G. Keith assembled a wide range of Spanish colonial documents from the early colonial period. These documents, published in five volumes as *New Iberian World*, are organized by date and region and offer first-hand accounts of early explorations of the New World and the processes of conquest and colonization through the early seventeenth century (1984). An example of what can be found in these works is a letter written by Eugenio de Salazar in 1573, which offers a wry, unvarnished perspective on life at sea for a passenger on an early transatlantic voyage. Salazar, a judge appointed to a position in the colonies, crossed from the Canary Islands to Santo Domingo. His portrayals of the close-quarters, seasickness, endless variety of putrid smells, fearless and plentiful vermin, and less than wholesome food, offer a particularly honest account of being at sea. Salazar also describes the social structure on board, the religious practices of passengers and crew, and the peculiar language used by the sailors, among many other things.

Another broad survey of the original Spanish archival documents has also been done by the French historians Huguette and Pierre Chanu (1955a), who compiled information about the Indies fleets for a period of nearly 150 years, from 1504 to 1650. Their effort resulted in annotated lists of the majority of ships that sailed back and forth between Spain and its American colonies during that time, along with sailing dates, ship's masters, and (if known) cargo lists and brief narratives of the voyages. The Chaunus' review of the early Spanish colonial shipping reveals a steady stream of scores of unsung ships crossing back and forth across the Atlantic. It is a remarkable achievement that puts into perspective the monumental scope of Spain's maritime effort.

The Archaeology of Sixteenth-Century Transatlantic Vessels

The St. John's Bahamas wreck is an exceptional example of an early shipwreck in the Americas, but a number of other sixteenth-century Spanish vessels have also been discovered in the Western Atlantic, the Caribbean Sea, the Gulf of Mexico, and European waters. Some of these sites are only understood in the broadest of terms; their identities and specific dates of loss are not known. Many are simply named for the reefs, islands, or beaches where they are found. These unnamed shipwrecks are dated to the sixteenth century because of the presence of certain characteristics, usually particular hull features, ceramic types, or wrought-iron artillery. Others are known by name and their original mission is understood. It is through the comparative study of this group of shipwrecks that the clearest current understanding of Spanish Trans-Atlantic vessels is known.

The earliest examinations of these ships came with the advent of SCUBA diving. With its availability to the layman in the post-WWII era, and the newly-accessible underwater world, ancient shipwrecks became a point of interest for many divers. These shipwrecks were generally regarded in historical terms, though not as archaeological resources and were frequently thought of in terms of adventure or sources of treasure. In the 1950's, 60's, and 70's there was much writing focused on this new interest in submerged shipwrecks. Some of these books were travelogue-like accounts of personal adventure, others served as how-to guides, but the focus was frequently shipwrecks in the Florida and the Greater-Caribbean area. One of the first to introduce readers to New World shipwrecks was "Treasure Diving Holidays" by Dr. Barney Crile and his wife Jane (1954). They recounted their family's diving adventures on ancient Spanish shipwrecks in the Florida Keys, and elsewhere. Importantly, the Criles partnered not only with Keys shipwreck diver Art McKee and underwater explorer Edwin Link, but also the Smithsonian Institution's curator of naval history Mendel Peterson, who brought an archaeological sensibility to the adventure. At nearly the same time, Edwin and Marion Link also searched for early Spanish shipwrecks

in the New World. Their work took them to The Bahamas, where they found a piece of early, wrought-iron artillery at the eastern end of Grand Bahama Island. The discovery spurred an interest in the voyages of Columbus, and they decided to search for his *Santa Maria*, lost in 1492 (Link, 1958). After conducting historical research to identify the likeliest location, the Links did find a shipwreck along Haiti's north coast, hastily concluded it was the *Santa Maria*, and recovered an anchor, which they donated to the Haitian government. Though there is no good evidence the Links actually found the *Santa Maria*, theirs was an important first step in recognizing early Spanish colonial resources recovered from the sea have potential to enhance public education. Another publication typical of 1950's underwater exploration examined the opportunities for new divers in both the recreational and professional world, and though it explored new underwater sciences such as biology, shipwrecks were largely thought of only as Spanish galleons with "countless billions of dollars in silver, gold, and jewels" (Barada, 1959).



Figure 1.3. Diver with an anchor thought to have come from Columbus' *Santa Maria*. (Photo: P. Stackpole, from Link, 1958:168).

In the 1960's, volumes began to appear, now based on extensive historical research, that listed New World shipwrecks by location and with descriptions of the cargoes, all with the purpose of inspiring divers to search for them. John Potter's "The Treasure Diver's Guide" (1960) offered a primer on shipwreck and artefact identification and the basics of underwater recovery and marine archaeology, along with a long list of ships ranked by their supposed value. In the revised 1972 edition, it offered an extensive accounting of the various treasure hunting and shipwreck exploration endeavours that had

taken place since the original volume's release. Robert Marx wrote a similar volume that relied heavily on research he had done in various European historical archives, especially the Archivo General de Indias in Seville, and which also gave advice on underwater survey and excavation methods (Marx, 1971). Both of these volumes were quite influential and inspired many adventurers to seek their fortunes from shipwrecks under the sea, and through the 1960's and early 1970s, these groups became the dominant actors in the exploration of early colonial shipwrecks in the Americas. Certainly, though, the nuggets of archaeological practice espoused in many of these "adventure" books, and more importantly the successful examples set in the field by archaeologists in the Mediterranean, began to take root, and in the 1970s and 1980's, archaeologists began to examine some of the sixteenth-century Spanish shipwrecks that were coming to light in the Americas. And with these formal archaeological studies, a firmer understanding of the ships and things used aboard them began to emerge.

The Bahia Mujeres wreck

One of the first early colonial sites to be explored is known as the Bahia Mujeres wreck. Adjacent to Isla Mujeres near Mexico's Yucatan Peninsula, the Bahia Mujeres wreck was discovered by local divers in 1958, at least one wrought-iron gun tube was salvaged and donated to a local school. In 1959, the site was further explored the Mexican dive organization *Club de Exploraciones y Deportes Acuáticos de México* (CEDAM) in conjunction with members of the Cannon Hunters Association of Seattle, conducted exploration and salvage operations at the wreck (Cannon Hunters Association of Seattle, 1960). Three or four cannons and two anchors were recovered by the group. The CEDAM team came to believe the wreck was that of *La Nicolesa*, a ship of Francisco de Montejo, who colonized Yucatan in the late 1520's. After 1961, because the wreck was heavily covered by coral, and no more artifacts could be found, interest in the site waned.

Again, seeing its potential to shed light on the subject of early Spanish colonial ships, archaeologists from Texas A&M University's Institute for Nautical Archaeology (INA), as part of a broader program to study the earliest historic shipwreck sites in the Americas, reawakened the story of the Bahia Mujeres wreck. In 1983, the INA team travelled to Mexico, where they were able to find many of the artefacts salvaged over 20 years earlier. The objects had not received proper conservation treatment and were badly deteriorated, but enough remained to determine the basic parameters of the collection. In the CEDAM museum were a *falconete grande*, a 2.1-meter *bombardeta* tube and two large breech blocks, a *verso*, a broken anchor, and a grapnel anchor. One other gun had also been recovered, but it was so

badly deteriorated that other than the fact that it was a wrought-iron, tube-barrel, no sound conclusions could be drawn about it beyond its existing length of 2.14 m.

The *falconete grande* is an unusual piece, looking like a cross between a *bombardeta* and a *verso*. It has a long, hooped, wrought-iron barrel, trunnions at its mid-point, and an iron receiver to hold a breech chamber. The stump of an iron tiller, by which the gun was steered on its rail-mounted pivot, is attached to the rear of the gun. The piece, even with a broken tiller and missing muzzle, is nearly 2-meters long.

In a 1983 visit to the wreck, the INA team found a ballast mound some 20m long sitting in just under 3m of water. The entire site was covered by a heavy growth of coral. Numerous positive contacts were made in and around the wreck during metal detector surveys, but none of them were identified. There was no way of determining where the recovered artillery and anchors had been located on the site.

Based solely on the artillery, the site appears to be from the sixteenth century, but there is scant evidence to support its being *La Nicolesa*. There has been no further study of the site since 1983, leaving specifics about the wreck unknown.

The 1554 fleet vessels *Santa Maria de Yciar* and the *San Esteban*.

In the spring of 1554, three ships left Vera Cruz, Mexico, bound for Spain. The journey of the *Espiritu Santo*, *Santa Maria de Yciar*, and *San Esteban*, was cut short by a storm that drove them onto the shore at present-day Padre Island, Texas. All three ships were hopelessly wrecked, but salvagers at the time were able to recover roughly one-third of the cargo.

In the 1940's, the site of the *Santa Maria de Yciar* was destroyed by dredging. In the 1960's, treasure hunters began to salvage the wreck of the *Espiritu Santo*, but public outcry over the removal of the shipwreck materials, and a subsequent legal battle between the salvagers and the state of Texas, led to the creation of the Texas Antiquities Committee (TAC). A 1969 court-ruling ordered that most of the salvaged items be returned to the state. The TAC began to conserve the already-recovered materials and in 1972, began the excavation of the *San Esteban*.

When the wrecks were first being studied, they had not been identified. It was only through an intensive documentary search in the Archivo General de Indias in Seville, Spain, that the story of the lost 1554 fleet was connected with the shipwrecks (McDonald & Arnold, 1979). The analyses of the wrecks and the materials recovered from them have proved to be seminal studies of early, Spanish-colonial shipping (Olds, 1976; Arnold & Weddle, 1978).

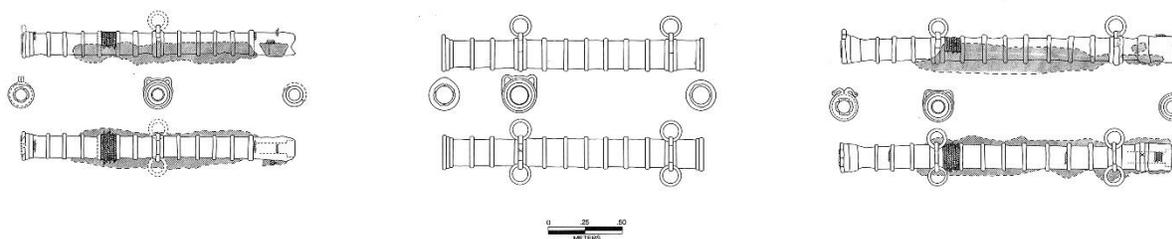


Figure 1.4. Three Wrought-Iron Bombardeta Tubes from a 1554 Fleet Shipwreck. (Arnold & Weddle, 1978: 246).

Though the materials from the wreck salvaged by treasure hunters had not been mapped in any way, and they represented only what the finders thought interesting, they have shed significant light on the material culture of a mid sixteenth-century Spanish sailing ship. Of the artillery, three *bombardeta* tubes and twelve breechblocks were recovered, along with five *versos* of two different sizes; stone, iron, and lead-covered iron shot for these guns were found. Small lead shot for firearms was also recovered. Three crossbows and a piece of a sword blade represented other on board weaponry. The ship's pilot carried at least three astrolabes to measure the latitude as a way of reckoning the ship's position. Hundreds of ceramic fragments include early-style olive jar necks; English pewter was used on the table. Even enema syringes were found, reflecting the ship's medical equipment. The ship also carried treasure: hundreds of coins came from Mexico and Santo Domingo, with none dating later than the early 1550's. Crude silver and gold ingots were cast at Mexican mines during the reign of Charles V.

A more thorough and systematic approach was taken with the site thought to be the *San Esteban*. The site was located through the use of a magnetometer, a device able to read the magnetic disturbance created by the shipwreck's iron objects. Once the wreck was found, it was excavated and mapped. All of the encountered materials were recovered. The site was found to be from a ship that was badly broken and scattered. A portion of the keel was all that remained of the ship itself, and it was surrounded by stone ballast and artefact conglomerates. Seven iron anchors, fasteners, shroud-chains, rudder gudgeons and pintles remained of the ship's hardware.

As at the site of the *Espiritu Santo*, three *bombardeta* tubes were found, one stowed alongside an anchor. Two of these tubes had partial remains of their wooden carriages, lashed to the guns by ropes. There were also two breech chambers for these larger guns. One iron *verso* was found, along with seventeen breeches and two wedges. A complement of stone, iron, lead-covered iron, and small lead shot was found. A piece of a crossbow cocking mechanism indicated the presence of these weapons.

Polychrome Spanish *majolica*, German stoneware, and pewter plates and porringers were used to serve food and drink. Barrel hoops indicated how food and water was stored. Foodstuffs in the form of seeds and nutshells were found. Cockroaches that once plagued the ship were found trapped in artefact encrustations. Dividers and sounding leads were used by a pilot to navigate the ship. Carpenter's hand tools were carried to make repairs to the ship.

The Highborn Cay Wreck

In 1965, three American divers found a mound of stone ballast, encrusted wrought-iron cannon, anchors, and chains jumbled on the sea floor in approximately 20-feet of water near Highborn Cay in the Exuma chain of the Bahamas Islands (Peterson, 1974). Curious about what they might have found, the group contacted Mendel Peterson of the Smithsonian Institution. Shortly after, in early 1966, a license to explore the wreck was granted to the owner of Highborn Cay. Peterson visited the site that summer to offer an assessment.

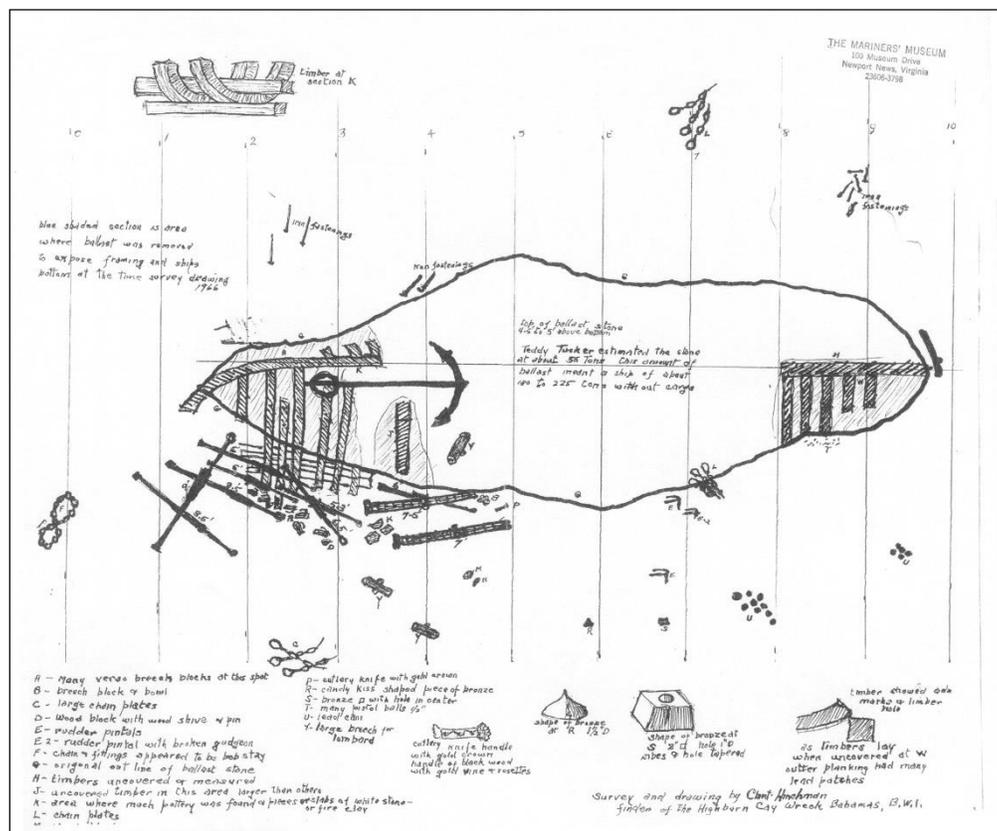


Fig.1.5. Site plan of the Highborn Cay wreck, 1967. (Drawing: Clint Hinchman. Collection of the Mariner's Museum, Newport News, Virginia).

During the evaluation, two anchors were found roughly 150 yards away from the wreck, indicating the ship was at anchor when it sank. While probing into the sand around the wreck, the explorers found large iron-cored lead shot, small lead shot, and iron nails and bolts (Fig.1.5). Peterson felt the wreck was certainly early, and worthy of continued study.

The team returned to the Highborn Cay site in January of 1967, and worked on it through May. This time Peterson and the wreck's discoverers were joined by experienced shipwreck salvagers from Bermuda. Excavations revealed two wrought-iron tube guns with four associated breech chambers, eleven *versos*, fifteen breech chambers, *verso* chamber wedges, additional large lead and iron shot, smaller lead shot, three anchors, pintles and gudgeons for a rudder, ceramic fragments, a gold-inlaid knife handle, and iron chain-plate rigging. It was thought that the hull remains indicated a lightly-built vessel with sharp lines, and, with its large complement of artillery, the ship must have been a "pursuer;" probably a pirate or privateer. And with few personal goods on the site, it was supposed it had been intentionally scuttled. The collection of recovered artifacts was divided amongst the wreck's discoverers, and then the Highborn Cay wreck was then largely forgotten for the next fifteen years.

Beginning in 1983, a team from INA worked to locate and re-evaluate the collection of materials that had been recovered in the 1960's (Smith, Keith, & Lakey, 1985). Some of the collection was at the Mariner's Museum in Newport News, Virginia, where it had been donated by the discoverers. The survey found two types of *verso* were on the ship – a "standard" *verso* of less than 2-meters and a *versodoble* that was 2.7-meters long. There was also a harpoon-like object with a shaft of 2-meters. Three sets of iron shroud chains that once helped to tie the mast-tops with the hull, a wooden deadeye, and bronze pulley sheave bearings, remained from the ship's rigging. Ship's fasteners in the form of iron nails and bolts were studied. Three fragments of a *melado*-type bowl and one piece of an unglazed, *bizcocho*-earthenware bowl were examined (Smith, 1986).

The INA team also visited the site itself in 1983, to evaluate its potential to shed light on the earliest ships of American colonization. The boundaries of the wreck were determined, the presence of artefacts was noted, and the condition of the hull was observed. The team concluded that the wreck was significant and warranted further study.

In 1986, INA archaeologists returned to the Highborn Cay site to uncover portions of the wreckage, and to study the ship's hull remains, especially. They excavated at either end of the ballast mound and removed a section of stones from the centre. The bow and stern ends of the vessel were determined by

the remains of the keel and by the presence of grooves cut into the bedrock by the ship as it rocked back and forth while it deteriorated. At the middle of the ship, they found a well-preserved keel, a keelson with a mast-step, floor timbers, futtocks, ceiling planking, and hull planks. The mast-step was set in an expanded section of the keelson, and it was buttressed on either side. The intersections of floors and 1st futtocks were strengthened by dove-tail mortise and tenon joints. The hull planks were fastened to the framing with iron and wood fasteners. All of the structural components were made of oak (*quercus*, sp.). The frames were spaced at an average of 40 centimetres. The investigation of the hull indicated a solidly-built ship with an estimated length of 19-meters, and 5.0 to 5.7 meters of beam.

After nearly 30 years, interest in the Highborn Cay Wreck was revived in 2015, with surveys to determine its preservation led by Texas A&M PhD candidate Nicholas Budsberg (Budsberg, 2015). Budsberg will continue fieldwork at the site in summer 2017 under the sponsorship of the National Geographic Society (Budsberg, 2016).

There has been no specific identification of the Highborn Cay wreck, but it is thought to date to the first half of the sixteenth century.

The Molasses Reef wreck in the Turks and Caicos

The Molasses Reef wreck is in the waters of the Turks and Caicos Islands. The wreck is notable for its large collection of wrought-iron artillery, complemented by other arms. Many other objects found on the site provide a glimpse into life aboard the ship. The site sits in 6-meters of water between the fingers of a reef on the western edge of the Turks and Caicos Bank.

The Molasses Reef wreck was found in 1976 by a private salvage group, who recovered at least one wrought-iron tube gun and two breeches, two *versos*, lead shot, stone shot, a lead pump valve, and a shot mold. By 1980, the group was declaring they had discovered the remains of Vicente Pinzon's caravel *Pinta*, a vessel famous for being one of the three ships that sailed in Christopher Columbus' pioneering 1492 voyage to the Americas. The government of the Turks and Caicos was suspicious of the claim and asked Colin Martin of the Scottish Institute of Maritime Studies to examine the wreck. Martin suggested the involvement of the Institute of Nautical Archaeology at Texas A&M University. The wreck was then the subject of archaeological excavations led by Donald Keith from 1982 through 1986 (Keith, 1987).

Of the weaponry at the site, there were three wrought-iron, hooped gun tubes – identified as two *bombardetas* and one *cerbatana* – and fifteen accompanying breech chambers (Simmons, 1988). There were also sixteen wrought-iron *versos* of three types, and 40 removable breech chambers for them. Two muzzle-loading, wrought-iron *haquebuts*, a type of “hand cannon,” were also found. Approximately 300 shot to fire from all of these guns were found. They were made of cast iron, wrought iron, lead, stone, and lead-covered iron. Other weapons, in the form of two fragments of barrels from matchlock firearms, two partial crossbows, and hollow, cast-iron grenades, complemented the artillery.

No dated artefacts were found on the site, but some artefacts help to tie the wreck to a period of operation. The ceramics found there especially, including necks of earthenware “olive jar” storage vessels, lead-glazed fine-earthenware called *melado* or “honey ware”, and fragments majolica plates and bowls, all of styles that date to well within the sixteenth century (Smith, 1986b).

Based on the vessel’s age, its location, the presence of shackles, and a fragment of ceramic particular to native Caribbean cultures, it is thought that the vessel was possibly a Spanish slaving vessel taking native Lucayans from the Turks and Caicos to sell them to colonists at Hispaniola (Keith, 2006). A study of the ballast of the Molasses Reef Wreck found likely sources of the stone to be the areas around Lisbon, Portugal, Bristol, England, and the islands of the eastern Atlantic, which certainly widens the possibilities for the vessel’s origins (Lamb, et al, 1990).

The Inés de Soto wreck of Cuba

In the spring of 1992, during surveys of the Colorados Reef on the northwest coast of Cuba, archaeologists from *Carisub*, then Cuba’s national underwater archaeological team, came across stone ballast with an associated *verso*, two breech chambers for larger tube-guns, and two anchors. The site was on the reef, in 1.4 to 3 meters of water. Excavation of the wreck began later that summer (López Cruz, 1995). Field research then continued at the site through 1995 (Escobar, Cabrera, & Alvarez, 1998).

Though there was some stone ballast and two anchors among the debris to indicate that a ship had been wrecked, no hull structure was found at the site. This was probably because the shallow site, exposed to wave action on a relatively hard bottom, did not allow for organic preservation.

The study of the shipwreck revealed a small collection of wrought-iron artillery: one *cerbatana* gun tube with seven associated breech chambers, two iron *versos* (one loaded and ready to fire) and two *verso* breeches; cast-iron and lead over iron shot for the larger gun, and lead shot for the *versos* (García,

1998a). In addition to artillery, part of a wooden stock for a matchlock *arquebus* was found, along with its associated lead shot. A ceramic collection contained early-style and middle-style olive jar necks, Moorish-influenced Spanish *majolicas*, Native American or African-influenced hand-molded ware, honey-glazed *melado* ware, and a Mexican earthenware *chocolatera* jar (Domínguez, 1998).

Though the site has not been identified, there are strong indications of its date. A *terminus post quem* of 1555 was provided by the presence of a bronze astrolabe bearing that date (García, 1998 b). The latest date at which the ship sailed is suggested by the treasure found at the site. Some 13,000 silver coins were found at the wreck, ranging from Spanish coins minted during the reign of Ferdinand and Isabela (1469-1504) to those made at Mexico City bearing the legend of Carlos and Juana made from 1536-1572 (Díaz, 1998 a). Dozens of silver and gold ingots were also found on the wreck, all bearing Mexican mint marks, but with none showing tax stamps from beyond the reign of Charles V (1519-1556) (Díaz, 1998 b). Analysis showed these ingots contained no trace of mercury. The mercury “patio” process, with its revolutionary ability to extract nearly pure metal from ore, was introduced to Mexican mining industry in 1555, where it spread very quickly. The lack of mercury in the ingots suggested that they were not refined via this process. Given this, the dates of the coins, and no markings beyond the reign of Charles V, it is thought to be unlikely that the Inés de Soto Wreck sailed any later than 1556.

The Playa Damas wreck

In 1997, an American diving off the beach at Playa Damas, on the Caribbean coast of Panama, swam over pile of wrought-iron artillery. He recognized the guns as early and significant and tried to engage the Panamanian government in a study of his discovery (White, 2002). Four years passed before any action was taken. Representatives of the government, the American discoverer, and a private salvage company formed a team to excavate the site. Artefacts began to be recovered, but, because of power struggles over control of the shipwreck, the alliance quickly dissolved into confusion.

Considerable interest in the site was generated by these initial efforts, though, and there was much public speculation as to whether or not the ship might be Christopher Columbus’ *Vizcaina*, abandoned in Panama in 1504; a book was even published exploring the possibility (Brinkbäumer & Höges, 2006). A group from Texas A&M University’s Institute for Nautical Archaeology visited the site in 2003, and, proposed an archaeological study of the wreck, funding to be provided by Germany’s *Der Spiegel* magazine (Castro and Fitzgerald, 2006). The INA offer was soon superseded by a proposal by an American treasure-hunting company, which was then rejected for one by a Panamanian salvage firm,

Investigaciones Marinas del Istmo (IMDI). In 2005, IMDI began recoveries at the wreck, but the project was soon stopped by the government. No further fieldwork has been done at the site.

Many artefacts have been recovered from the Playa Damas shipwreck during the confused course it has suffered since its discovery. These items include wrought-iron gun tubes and their accompanying breeches, iron *versos* and their breeches, *falconetes*, stone shot, shroud chains, barrel hoops, thousands of fragments of olive jars, iron fasteners, and many unidentified objects (Castro, 2005). These objects were last reported to be in wet storage at Playa Damas, awaiting conservation, but with no agency in obvious charge of them, what will become of these items is not clear.

The Emanuel Point wreck I

In October of 1992, while conducting a magnetometer survey of waters near Pensacola, Florida, a group called the Pensacola Shipwreck Survey Team, organized by the Florida Bureau of Archaeological Research and the University of West Florida, located a mound of stone ballast in 15 feet of water. The wreck was studied during two fieldwork campaigns. The first had three periods of excavation between 1993 and 1995 (Smith, et al, 1995). The second had two periods of excavation from 1997 to 1998 (Smith, et al, 1998). Over the course of excavation, the project was supported by a broad consortium of public and private entities. The study of the wreck also served as a training ground for archaeology students.

The wreck's pile of ballast-stones had become an artificial reef of sorts and was covered by a layer of oyster shells and silt. This cover served to seal the site from decay and made for remarkable preservation of the wreck; its organic elements in particular. About 40% of the site was uncovered through the selective placement of excavation units that ranged across the wreck from stem to stern (Fig. 1.6). The well-preserved hull remains indicated a sizable ship. At the stern, a sternpost, tail-frames, hull strakes, a rudder and its mounting hardware were all found. A trench through the ballast at amidships uncovered a mast-step in an expanded section of the keelson that was buttressed on either side, bilge-pump wells, and assemblies of floor timbers, futtocks, ceiling planks and hull strakes. At the bow were more floor timbers and futtocks; hull strakes were complemented by hanging knees, sections of the bow stem, and two hinged port covers. Combinations of iron and wood fasteners were noted throughout the ship. Many lead patches suggested an aged vessel. An anchor was also found at the ship's bow. An interesting silhouette representation of a sailing ship, matching images from the early to mid-1500's, was found in the bilge of the Emanuel Point I wreck; apparently the discarded handy work of a ship's carpenter.

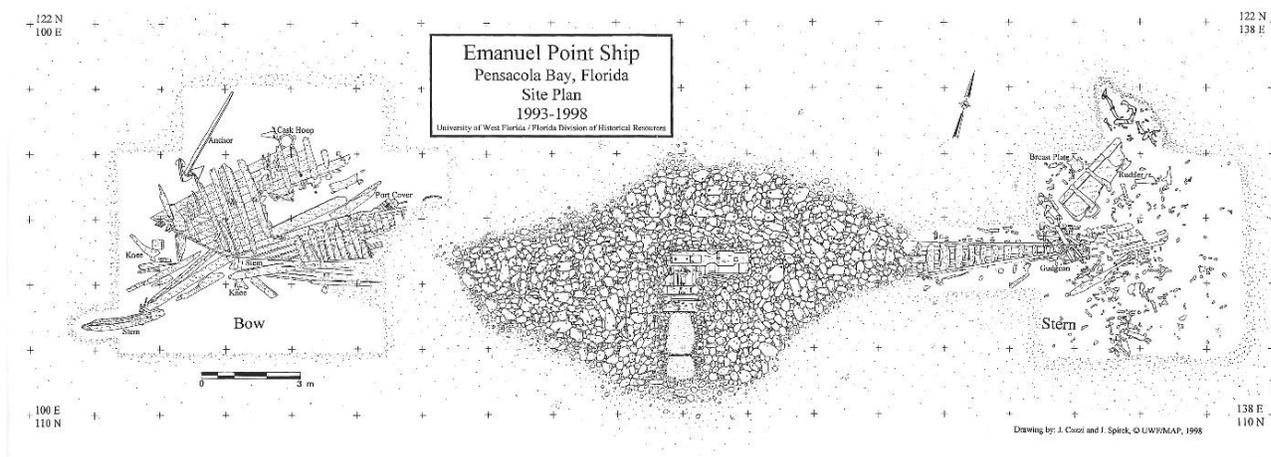


Figure 1.6. Emanuel Point I Shipwreck Site Plan. (Drawing: Cozzi & Spirek from Smith, et al, 1998: Fig.5).

There was no artillery discovered at the Emanuel Point I wreck, but stone shot, lead covered iron shot and cast iron shot all indicate there were once large guns on board. Smaller round lead shot appropriate for both *versos* and firearms were also found. Copper quarrels for crossbow bolts, an iron breastplate, and razor-sharp, Aztec-style obsidian blades favoured offer additional evidence that those on board the ship were prepared for a fight.

A large number and variety of copper galley items were found near the bow of the wreck. Olive jars of an “early-middle” style were found, as were *melado* earthenware, tin-glazed *majolicas*, German stoneware, and pieces of Aztec ceramic vessels. Cask remains reflected a strategy for storing food and water on the ship.

Recovered bones seeds represented the remains of foodstuffs. Vermin on the ship that infested the food and cargo were found as the bones of mice and rats, as well as insect remains.

From the start of the survey, it was known that eleven ships were lost at Pensacola by Tristan de Luna in 1559, during an attempt to colonize Florida via Mexico. Though the Emanuel Point I wreck has not been identified by name, everything found in the study of its remains supports the idea that it is one of de Luna’s vessels. This would make it the first known example of a “ship of colonization,” from the early Spanish period, carrying people and goods for the express purpose of establishing a settlement in new lands.

The Emanuel Point wreck II

Encouraged by the discovery of the Emanuel Point I Shipwreck, and the knowledge that other ships from Tristan de Luna's 1559 fleet were likely lost nearby, archaeologists continued to survey the areas near the Emanuel Point I shipwreck site. A magnetometer survey was conducted in 2006, which located two shipwrecks. One wreck, in 4 meters of water, was a pile of stone ballast covered with oysters and silt, with strips of lead sheeting, iron concretions, and Spanish ceramics typical of the sixteenth century scattered around it (Cook, 2009). Test excavations revealed well-preserved wooden hull remains below stone ballast.

Between 2007 and 2009, three periods of excavation took place at the wreck, now dubbed Emanuel Point II. These excavations have uncovered 38 square meters of the site, in areas at the bow, amidships, and stern. The excavations have revealed remains of the lower hull of the ship, from the keel to the turn of the bilge, including the keel, keelson, framing timbers, ceiling planking, and outer hull planks. Lead sheeting was observed on the exterior of the hull, probably used as an anti-fouling device. Many of the construction design features matched those of other known sixteenth century shipwrecks, including the Emanuel Point I site. The Emanuel Point II ship, though, is considerably smaller than the Emanuel Point I Shipwreck.

The silty bottom sediments and the protective layer of oyster shells combined to preserve the organic features of the Emanuel Point II site. As excavations progressed, the team noticed small organic items passing through the dredge screens. A method of sampling the sediments and processing them after recovery was devised to collect these small organic components (Lawrence & Shidner, 2009). By swirling the sediment in water, the lighter bits of organic material were suspended long enough to be collected. Among the items recovered were a number of seeds, including olive, cherry, plum, walnut, hazelnut, almond, persimmon, hickory, and acorn. Also found in the sediment samples were the remains of cockroaches, weevils, and hide beetles.

As is typical of Spanish shipwrecks, a variety of ceramics has been collected at the Emanuel Point II site (Sorset, 2009). To date, a collection of nearly 1000 ceramic fragments, composed of olive jar, plain tin-glazed ware, painted tin-glazed ware, *melado*, and crude, lead-glazed earthenware has been found. An unidentified black-grey ceramic type might be a type of Native Mexican ware.

The Emanuel Point II Shipwreck certainly appears to be another vessel lost when a hurricane struck Tristan de Luna's colonization expedition to Florida in 1559. And considering it is only 400 meters from

the Emanuel I shipwreck site, they are certainly spatially linked. To further link the two, the hull remains of the second wreck bear many of the same hallmarks as the Emanuel Point I ship; many of the artifacts on the two sites are of the same type. The analysis of the Emanuel Point II Shipwreck is in its early stages. There will be much more to come from this site.

The Emanuel Point Wreck III

In late 2016, the University of West Florida announced the discovery of a third shipwreck believed to be associated with the Tristan De Luna expedition of 1559 (St. Myer, 2016). There are significant, well-preserved wooden hull remains, ballast stones, and ceramic fragments found at the site. Though this ship is only in the earliest stages of research and little is known about it, there is some thinking that it might be a smaller vessel than the other two, related sites, as it was found in 7 feet of water closer to shore.

Saona Island Sites

Three shipwreck, or at least ship-related, sites were discovered in 1983, around Saona Island, off the south-eastern coast of Hispaniola, by "Operation Saona," a treasure hunting expedition teamed with archaeologists from the government of the Dominican Republic. The group was looking for shipwrecks related to the lost 1502 fleet of Nicolas de Ovando. Two of the discovered sites were labelled "pre-sites" because it was thought they only represented spilled materials from vessels in distress. One was thought to be the site of a wrecked ship and was called the *Caballo Blanco* wreck.

The three sites were all distinguished by wrought-iron artillery. Site 1, in 6.5 meters of water, consisted of four *versos*, one hooped gun-tube, two large breech chambers, two anchors, ballast stones, and olive jar sherds. The remains of a nineteenth century shipwreck were scattered in and around the site. One *verso*, the gun tube, and one large breech chamber were recovered.

Site 2 was scattered on a hard bottom in 2.4 meters of water less than a mile to the south of the first site. It consisted of ballast stones, one tube gun, three breech chambers, eight *versos*, one haquebut, ceramic sherds, and an anchor that was encrusted with what appeared to be an additional seven or eight haquebuts. Of these, the gun tube, two *versos*, one breech chamber, and a haquebut were recovered.

Site 3, the *Caballo Blanco* wreck, was found in two areas 150 meters apart. At one spot, two gun tubes, two breech chambers, and two anchors were found. At the second spot were four *versos*; they were

mixed with wreckage from an eighteenth century wreck and debris from a modern sailboat. Nothing was recovered from the *Caballo Blanco* site.

The artefacts that were recovered during Operation Saona were erratically maintained and conserved. Some ten years after their recovery, Sam Turner, an archaeology graduate student at Texas A&M University, began a study of the Saona collections (Turner, 1994). He found them in varying states of preservation in private collections in the US and in museums and repositories in the Dominican Republic. The collections had been mixed, and artefact tags were missing, so Turner spent much time comparing measurements and other features of the artillery to the field notes and recollections of the salvagers.

Examination of the recovered artillery, despite the poor condition of some of the pieces, did reveal construction and design features. The artillery recovered from Site 1 proved to be a *verso* and a tube gun that was either a large *cerbatana* or small *bombardeta* with a matching breech chamber. The guns from Site 2 were the remains of a larger *verso doble*, a *cerbatana* tube gun with a matching breech chamber, and a muzzle-loading *haquebut*. The *haquebut* had a touch-hole on the side rather than the top, thought to be an indicator of a date between the 1470's and ca.1525. It was thought that because many other *haquebuts* were found on the site, it might be an indicator of an early date for the ship; likely between the late 1490's and 1525. The other artillery compared favourably to examples recovered from contexts dated between 1513 and 1554, seemingly dating the sites to within those parameters. Some questions linger about the three sites, though: Do the collections reflect what was likely typical early sixteenth century artillery in the New World for smaller ships? Do smaller complements of artillery, i.e. two tube guns and four *versos*, signify an inter-island trader? And does a more heavily armed vessel signify another purpose, such as war against natives, or an Atlantic-trader?

Red Bay Basque 1565 whaling vessel *San Juan*

In the 1970's, Canadian historians uncovered evidence that a sixteenth century Basque whaling station had existed in Newfoundland; stories which were soon proved archaeologically when Iberian artefacts of the appropriate age were found at a place called Red Bay. As research continued, an account was found of a whaling ship named *San Juan* lost in 1565 in shallow water just offshore of the whaling station. In 1978, archaeologists from Parks Canada located a shipwreck that appeared to be *San Juan* in 30 feet of water and 100 feet offshore. The site became the focus of an especially-detailed underwater study that carried on through 1985 (Grenier, Bernier, & Stevens, 2007).

Navigational instruments, including a compass and astrolabe, shoes, wooden dishes, unglazed earthenware jars, olive jar fragments, tin-glazed *majolica* pitchers, plates and bowls were found scattered in the wreckage. A badly eroded, but still loaded, wrought-iron verso was found. The presence of larger guns can be inferred from large cast-iron shot found on the site. Other recovered shot includes lead shot appropriate for the verso, and smaller lead shot, most likely for firearms. Wooden rigging elements were also found. Thousands of wooden barrel staves remained from what was likely a cargo of whale oil.

The hull structure of the Red Bay ship is the most significant feature of the site. The sheltered, extremely cold conditions allowed for much of the hull to be preserved. Though the hull had collapsed and was found flattened, it was in remarkably good condition under a layer of silt. The original surfaces of the wooden components were preserved, including marks from the shipwright's tools.

Over the course of the study, the team from Parks Canada removed the components of the hull, documented them topside, and then reburied them. This allowed them to reconstruct the remains and devise models of its original appearance. The ship's remains indicate that it was a three-masted, square-rigged vessel of 250-300 tons. It had a flat transom. At the mid-ships, there was a buttressed mast-step set into an expanded keelson. The vessel was assembled with a combination of iron spikes and bolts, and wooden nails.

The remains of the *San Juan* are the best preserved and most complete example of an early Spanish ship in the Americas. The study of the wreck, lost at a settlement along the frigid waters of the Canadian Atlantic, has also brought awareness to the broad range of the Spanish colonial maritime system.

Western Ledge Reef Wreck

A shipwreck was discovered in approximately 10 metres of water on a reef west of the Bermuda Islands during archaeological surveys conducted by East Carolina University (ECU) working in conjunction with the Institute of Maritime History and Archaeology at the Bermuda Maritime Museum (IMAH) (Morris, 1990). The site was distinguished by two ballast piles; one with hull structure protruding from underneath and the other representing stones removed by earlier salvage operations. A review of Bermuda salvage records showed that the site had first been discovered in the late 1960's and was under active salvage license. Through an agreement with the license-holders, the IMAH/ECU team was granted permission to further excavate the site and study its artefacts.

A number of items had already been salvaged from the shipwreck. These included a cast-iron, muzzle-loading cannon dated 1577, seven other cast-iron guns, two wrought-iron *versos*, and three anchors. The ship's significant ceramic collection was composed of thirteen olive jars, tin-glazed *majolica* pitchers, bowls, and drinking vessels. Ships' fittings and hardware included a bronze bell and wooden rigging blocks. Evidence of cargo was found in the form of wooden crate lids, and what appeared to be the remains of tobacco and other organic items. Other artefacts found on the wreck included a pewter bosun's whistle and bronze dividers.

In 1989, test pits were excavated by the IMAH/ECU team to determine the distribution and integrity of the site, with little intact, undisturbed wreckage being found. Investigations into one of the ballast piles revealed a significant section of lower-hull structure buried beneath it. This was the lowest part of the vessel's amidships section. This included the keelson with a mast-step, fourteen floor timbers, futtocks, and hull planking. The hull remains were fastened with combinations of iron and wooden fasteners. Nearby was a lightly-buried section of the ship's stern-post, with two rudder gudgeon straps attached; a third one resting loose next to it.

During the initial survey, the archaeologists found additional earthenware ceramic sherds, as well as organic remains, animal bones, glass fragments, and iron concretions.

The following two years were devoted primarily to studying and recovering the remains of the ship's hull (Watts, 1993). The 1990 season was oriented around documenting the hull through drawings and photographs. In the 1991 season, the documentation was finalized and then the hull was disassembled and recovered. The well-preserved oak remains of the lower-hull prominently featured a keelson expanded for the main-mast step. This mast-step was supported by three buttresses on either side. The buttresses were fastened through adjacent ceiling planks, to the floors and futtocks below. Of the floor timbers, the master couple was just forward of the mast step. Dovetail mortise and tenon joints were found at each join of floor and futtock. The keel of the ship was attached by iron bolts running through every fourth floor frame. The ceiling planks were lightly attached, and the outer hull planks were fastened with iron spikes and wooden treenails.

A section of the stern assembly, consisting of the lower portion of the stern-post and knee, "wye-piece" tail-framing timbers, hull planking, and rudder gudgeons, were the other significant surviving portion of the ship. The gudgeons were designed to fit over a relatively flat transom, and fragments of transom planks did survive trapped in the iron concretion; they were placed at an angle of 27° to the sternpost.

The recovered timbers from the Western Ledge Reef wreck were held in storage for many years at the Bermuda Maritime Museum. In 2007, Texas A&M archaeology graduate students began an effort to further document the remains (Bojakowski, 2008). They reviewed and organized the initial field data and created scale-drawings of the individual timbers. The remains of the Western Ledge Reef wreck were found to be very well-preserved and represent nearly the entire bottom of the ship. They are some of the most complete hull remains from an early Iberian vessel found in the Caribbean region.

Marex Mystery Wreck

In what is perhaps one of the great tragedies in the archaeology of sixteenth-century shipwrecks, the Memphis-based treasure-hunting company Marex International, Inc. discovered, and then rapidly and haphazardly recovered the remains of an early shipwreck. The wreck was found in 1992, on a shoal along the western edge of the Little Bahama Bank, approximately three miles northward from the St. Johns wreck. The Marex site was distinguished by approximately 300 Mexican “tumbaga” ingots, made from a mixture of silver, copper, and gold. There was also a large bronze cannon dated 1543, bearing the mark of English gun-founders John and Robert Owyn (Hudson, 1992). It is also reported that wrought-iron artillery was also found, as were two cast-iron guns of supposed Spanish origin. Supplementing the large guns were ten matchlock harquebus barrels. Also, Spanish silver coins from the reign of Philip II, a silver jaguar figurine, elephant tusks, Chinese porcelain, bilbo-style iron shackles, glass chevron beads, an earthenware olive jar filled with black sand, bronze dividers, and unidentified rigging elements, among other things, were recovered from the wreck (Marex, 1992; Horner, 1999). A 15-pound stone carved with the visage of an elephant, done in a style resembling “elephant masks” made by the Gouro people of the Côte d'Ivoire, was also found (Swann Galleries, 2011:16). The stone, along with the tusks and shackles, suggests the ship was an early transatlantic slave trader.



Figure 1.7. Stone with carved visage of an elephant from the Marex Mystery Wreck. (Photo: Swann Galleries, 2011:16).

There has been some debate as to whether the collection represents one or two shipwrecks, with the tumbaga ingots representing one site and the other materials another. But because the excavations are so poorly understood, this may never be known with certainty. The collection is now sold and scattered, and it would take a considerable amount of detective work to pull together the details of what was undoubtedly a significant shipwreck.

Sixteenth-century wrecks Outside of the Spanish Colonial System

There are a number of sixteenth-century shipwrecks outside of the Spanish colonial transatlantic system that can help to shed light on the St. Johns wreck. Some are Spanish, some are not, but, largely because of the similar times in which they sailed, they all have aspects that relate to the ship or its artefacts.

The Spanish Armada Wrecks

In 1588, Spain organized an armed fleet to invade England and overthrow the government of Elizabeth I. Some 130 various ships sailed in the planned attack. The Spanish underestimated the skill and capabilities of the English navy and were further set back by bad weather. Some 15 Spanish ships were sunk, primarily along the western coast of Ireland. In the 1960's and 1970's, three wrecks of the Spanish Armada - *Girona*, *Santa Maria de la Rosa*, and *Trinidad Valencera* - were located by divers (Martin & Parker, 1988). There was little remaining of the ships themselves, but the salvage and excavation of these sites has yielded a large number of artillery pieces, other weapons, galley ware, ceramics, religious items, jewellery, and many personal possessions, that combine to offer a strong insight into the material culture of late sixteenth century military life at sea (Flanagan, 1988; National Maritime Museum, 1988).

The Studland Bay Wreck

In early 1984, a fisherman working in Poole Harbour, Dorset, England, snagged his net on a submerged obstruction in 12 meters of water. Divers called in to free the gear found remains of an old wooden shipwreck, and they contacted the Poole museum about their discovery (Ladle, 1993). From 1984 to 1992, the wreck was excavated by teams associated with the Poole museum.

Three sections of hull structure and associated artefacts were found at the site: a 22.5-meter length of the vessel's starboard side, a 12.5-meter section of the forward part of the keel with mid-ships floor timbers, and a deposit of loose wood and other artefacts (Thomsen, 2000). The structure is similar to those of Iberian design found in the Americas, minus dovetail scarfs in the joins between the floors and first futtocks. Hull planking was attached to the framing with iron and wooden fasteners. The ship was

built entirely of oak. Analysis of a sample of stone ballast showed that just over half of it originated in the Basque region of Spain.

Other items recovered from the wreck include cask remains, wooden dishes, leather shoes fragments, combs, woven matting, bones, seeds, and ceramics. Two pieces of artillery were found, a two-meter *bombardeta* tube and breech chamber, and a *falconete* swivel-gun and breech chamber. Stone shot of three sizes was also found.

The ceramics from the Studland Bay Wreck consisted of "Isabela Polychrome" ware, painted blue and purple, and copper lusterware; both types closely linked with Moorish traditions in Andalucía. Smaller numbers of Spanish lead-glazed wares, Portuguese earthenware jars and dishes, and pieces of two French vessels, were also recovered.

The Studland Bay Wreck has not been identified by name, but it has hull features similar to those found on known Iberian shipwrecks from the sixteenth century. The artillery collection, though small, dates to a similar period. And the ceramics, especially the Spanish wares, date from the late 1400's to the first half of the 1500's. These facts, combined with ballast from the north of Spain, strongly indicate the ship was Spanish. It is believed that if indeed it was a Spanish vessel, it would most likely date to before 1533, when Henry VIII broke from the Catholic Church and relations between Spain and England effectively ceased for many years.

Mary Rose

The *Mary Rose* was a nearly 800-ton Tudor-era warship, sunk in 1545. The vessel had been in service for 33 years when it was lost in the Solent, the strait between mainland England and the Isle of Wight. The site was first found in 1836 by early diving pioneers John and Charles Deane. In 1965, members of the British Sub-Aqua Club formed a team to locate the *Mary Rose*, and they found success in 1971 (Mckee, 1982). Limited excavations over the next seven years found the wreck to be very well preserved with a large portion of the ship's hull remaining. In 1979, the Mary Rose Trust, dedicated to the archaeological study of the ship, began large-scale study of the site. Intensive field efforts continued for the next three years (Rule, 1982).

The study of the *Mary Rose* has been one of the most prominent marine archaeological efforts anywhere. It involved the excavation and recovery of nearly half of a large and intact hull, as well as many thousands of objects within it. The site has been a true time-capsule with objects ranging from

large artillery pieces to the smallest organic remains being recovered from the wreck. The wreck has proved to be a tremendous source of information regarding early sixteenth-century shipbuilding, maritime warfare, and life at sea. Research into the *Mary Rose* is continuing.

The Alderney Wreck

In 27 meters of water off the island of Alderney, in the Channel Islands between England and France, lies the wreck of what appears to be a late sixteenth-century shipwreck. The site was discovered in 1980, by a fisherman who found artefacts entangled in his gear. A local dive club began to explore the wreck and recovered many artefacts over a fifteen-year period. In 1991, Oxford University took over the project but withdrew shortly after. In 1996, a specially organized maritime trust was put in place to lead the research into the shipwreck (Bound, 1997).

Little was left of the ship itself, except for the rudder and a few loose, scattered timbers, including two gun ports. Two cast-iron sakers were found, as were accompanying cast iron balls and expanding shot. Dozens of matchlock muskets were recovered, as was one wheel-lock musket. Powder flasks and smaller gunpowder containers were also found on the wreck, as were swords, rapiers, and daggers. Armor in the form of iron helmets, breastplates, and back-plates add to the militaristic character of the ship.

Personal items of shoes, eating utensils, grooming tools, and northern European ceramics tell of life on board. Lead scale weights bearing stamped marks of Elizabeth I were found, giving the ship a general date. Based on the archaeological evidence, combined with historical research, there is sound speculation that the shipwreck is the remains of an unnamed military transport known to be lost in the area in 1592.

Gresham Ship/Prince's Channel wreck

A shipwreck known as the "Gresham Ship" was found in 2003 by the Port of London Authority during a maintenance survey of the Prince's Channel in the Thames estuary (Auer & Firth, 2007). The site was initially salvaged to clear the channel, but the discovery of wooden hull remains, iron bars, and an iron cannon, prompted a call to Wessex archaeology for scientific investigation of the wreck. During this 2nd survey, one more cannon was located, as was more hull structure. Two anchors were also found on the wreck. In the fall of 2004, the wreckage was recovered for shore-side study and conservation.

All told, there were five sections of wooden hull found at the site, constituting much of a vessel's bow and port side from just above the keel to the bottoms of the gun ports above the orlop deck.

Interestingly, the ship was “furred,” meaning that a second set of framing was layered to the outside of the original frames, as a way of increasing the width of the ship. The hull planks were fastened with wooden treenails and caulked with tarred hair. From the dimensions of the hull remains, the ship appears to have been a small to mid-sized armed merchantman, somewhere around 150 to 250 tons. Dendrochronological analysis indicated that the vessel was likely built of wood from East Anglia sometime shortly after 1574.

Artefacts from the site include three cast-iron muzzle-loading cannon. One small saker bore the “TG” mark of Thomas Gresham, an English gun founder who worked from 1567-1579. The other cast-iron guns were much larger but unmarked. A relatively short (1.2 meter) wrought-iron gun tube was also found, and it was strapped with iron bands designed to hold it to a wooden cradle. A pike-head on a wooden shaft was the only other weaponry found. A pewter candle-holder, leather garment fragments, leather shoe soles, and a piece of a Spanish olive jar provide a glimpse of the lifestyles of those on board. Iron bars, tin ingots, and lead ingots were also found. The iron bars are strikingly similar to one found on the St. Johns Wreck (Birch, 2009).

Historical research indicates that the site was discovered and likely salvaged in 1846. Study of the Gresham Ship is continuing.

Cattewater Wreck

In 1973, during channel dredging near Plymouth Sound, timbers and artillery from a shipwreck were found. The items appeared to be quite old, and archaeologists studied the site for three years, from 1976 to 1979 (Redknap, 1997).

The remains of the hull represented the lowest portion of the ship, near its middle point. Fourteen floor timbers were attached to the first futtocks using a dove-tail mortise and tenon joint. The hull planks were attached to the framing by combinations of iron and wooden fasteners. The keelson was expanded for a mast step and buttressed on the sides for reinforcement. The dimensions of the hull’s remains suggested a ship of somewhere between 200 and 300 tons. An examination of the ballast showed the stone to be local, or from other areas of southern England.

Artillery in the form of three identical swivel guns was used to defend the ship. The guns are small, hooped, wrought-iron tubes of 1.2 meters, strapped into oak beds with iron bands. They are unusual in

that they were fitted with swivel mounts that set into the ship's rails. One breech chamber, and shot of lead and locally-sourced stone and were found to go with the guns.

Other objects include English, French, and Rhenish ceramic vessels, a fragment of a wooden lantern, a wood bucket lid, and shoes and cloth of late fifteenth to early sixteenth-century designs.

The hull of the Cattewater Wreck has what are thought to be Iberian features, but considering the other evidence, it clearly had strong connections to the south of England.

The Mukran Wreck

In 1985, in the German Baltic off the Island of Rügen, Navy divers discovered a bronze cannon. After recovering it, markings were revealed that showed it was made 1551 for the Danish king Christian III. The gun was eventually placed in the Rostock Maritime Museum. Museum researchers tried unsuccessfully to locate the site where the gun was found. In 1994, a multi-agency effort was successful and found the site in 2.5 meters of water, very near the shore (Springmann, 1999).

Nearly 20 meters of wooden hull was on the sea floor. It was the bottom of a ship, and included the keel, keelson, floor timbers, ceiling planks, and hull planking. A mast-step was set into the keelson, but it was not buttressed. The ship was fastened with wood and iron fasteners. Based on the rise of the floor timbers, the researchers have deduced that the ship had a relatively wide beam and may have originally been a merchantman.

Few artefacts were found on the Mukran Wreck, but there was a small, significant collection of artillery. In this group there was an iron breech-loading gun tube, and the unusual bronze breech-loading cannon. The bronze piece consisted of a 68 centimetre portion of the rear of a tube; attached to it was a 40 centimetre breech chamber. The receiving end of the tube was flared, making it look much like a muzzle. The tube's end was marked with an "A," which aligned with a "B" marked on the breech chamber. The gun had a bore of 5 cm, corresponding to a 1 lb shot. A piece of a second bronze chamber was also found. Six-pound and one-pound shot were found on the wreck.

Historic research suggests that the Mukran Wreck was lost during the Nordic Seven Years War (1563-1570).

Oranjemund Shipwreck

A shipwreck was found by diamond miners in 2008, along Namibia's Skeleton Coast. The wreck was found when a cofferdam was built out from the beach to expose the sea bottom, which was then dredged for diamonds. It was this dredging that uncovered the wreck some 200m from the natural shoreline. Sections of a ship's hull, cannon, elephant tusks, anchors, tin ingots, and an assortment of personal goods were discovered by the miners. Work was stopped and heritage authorities were contacted for advice. An archaeologist was hired and excavation commenced, but the scale of the project was larger than initially thought. The excavation was stopped and a team of experts from Africa and Europe were brought in to study the wreck. A renewed excavation was started in late 2008 (Chirikure, Sinami, Goagoses, Mubusisi, & Ndoro, 2010).

Three areas of wreckage were delineated, with a layer of copper ingots covering much of the wreck and serving as a protective shield. Some 40 tons of copper, lead, and tin ingots were found to be covering the wreck. Marks on much of the copper cargo were those of the Fugger family, a group of German bankers and venture capitalists prominent in the fifteenth and sixteenth centuries. Another cargo was represented by thirty-two African elephant tusks and one hippopotamus tusk. There was also a section of the wooden hull's upper works, and its dimensions suggest a vessel of some 40 meters in length. Ten iron anchors made for an impressive array of ground tackle, and rolls of lead sheet were on-hand to make patches if the hull was breached. The ship was navigated by using at least three bronze astrolabes, and courses were plotted by using bronze dividers.

Over 2000 coins, 90 percent of them gold, were found; nearly 90 percent of them were Spanish, and eight percent were Portuguese. The remainder was a mix of French, Arabic, and Venetian specimens. All of the coins dated to the late fifteenth or early sixteenth centuries; one type of Portuguese coin was of a variety that had been withdrawn from circulation in the late 1530's. Eating utensils and cutlery were found, as were pewter plates, pitchers, and bowls. Animal bones and seeds remained of the food stores. Medical and hygiene equipment in the form of a bronze syringe, nit combs, and a mortar and pestle set, give a sense of how the people on board lived their lives. The ship was armed with at least one bronze muzzle-loading cannon and six bronze versos. These guns fired stone and iron shot, ranging from 10 to 25 centimetres diameter. A crate of sword blades may have been part of a cargo.

Though the study of the Oranjemund Shipwreck is not complete, all evidence suggests that the vessel was originally a well-armed Portuguese trader wrecked during a voyage to the Indian Ocean sometime around 1530.

Terrestrial sites

Though shipwrecks are the most direct parallel, there are Spanish colonial terrestrial sites that compare favourably to the St. Johns wreck. Excavations at sites throughout Spanish America have uncovered items that are similar to those found on the shipwreck.

La Isabela

The town of La Isabela was the first planned establishment of a European community in the Americas. La Isabela was established on the north coast of Haiti by Christopher Columbus in his second voyage to the New World. Its inhabitants were unable to carry on for long in the strange, new environment, and in 1498, the community had collapsed. Excavations at the site provide a glimpse at Spanish-colonial material culture at the end of the fifteenth century (Deagan & Cruxent, 2002). Among the items found at Isabela were ceramics, construction materials, clothing hardware, jewellery, and weapons.

St. Augustine

Spanish St. Augustine was founded in 1565, by Pedro Menéndez de Avilés. It has been continuously occupied ever since, making it the oldest community in the United States. For most of its early existence, the town served as a military outpost and mission to the native populations. There was a strong interaction with the Native Americans, leading to strong cross-cultural influences in the material culture. The artefacts assemblages seen from the sixteenth century reflect a no-frills lifestyle at the fledgling, colonial out-post. Ceramics and structural hardware comprise the majority of the Spanish items seen on the sites, along with some weapons and personal goods (Deagan, 1985). Lyon (1992) has added considerably to the understanding of the material culture of Florida's earliest Spanish colonists by reviewing inventories of personal possessions from wills, legal papers, and other documents, and a considerable scope of material not fully seen in the archaeological record is revealed by the written evidence.

Santa Elena

The Spanish colony of Santa Elena, established in 1566, sat along the Atlantic shore of modern-day Parris Island, South Carolina. Santa Elena served as the capital of Spanish Florida from 1566 to 1587. It was the home to Pedro Menéndez de Avilés when he was in Florida. Excavations conducted at the site by the South Carolina Institute of Archaeology and Anthropology resulted in a tremendous amount of information about the history and material culture of the small colonial town (South, Skowronek, &

Johnson, 1988; South & DePratter, 1996). A large collection of ceramics, hardware, pieces of weaponry, and many personal goods were found, and the relatively narrow duration of Santa Elena gives a very good snapshot of Spanish colonial material culture in the mid to late sixteenth century.

Puerto Real

The Spanish colonial community of Puerto Real was established on the north coast of present-day Haiti in 1503; it remained there until 1578. Excavations at the site have provided a large number of materials reflecting the lifestyles and material culture of the Spanish colonists as they adapted to life in a settlement of the early American colonies (Deagan, 1995; Ewen, 1991). Ceramics, hardware, foodstuffs, personal effects, beads, and coins all shed light on the how life was lived at Puerto Real.

Material Culture Studies

Spanish colonial archaeologists have catalogued large numbers of items from the period, looked at them outside of their specific contexts, and tried to make sense of them within the broader frameworks of style, chronology, and function. Kathleen Deagan has examined objects by type and function – ceramics, glassware, religious objects, personal possessions, etc. - from Spanish sites found throughout the Americas, and developed typologies for these artefacts as they occur through time (1987, 2002b). Deagan's studies included, Spanish colonial ceramics have received the broadest and most intensive research. The Florida archaeologist John Goggin conducted the first comprehensive study of the Spanish earthenware amphorae known as "olive jars," which proposed a typology for the containers that is still influential (Goggin, 1960). Goggin also organized a comprehensive study of Spanish majolica found in archaeological contexts in the Spanish Americas (1967). Florence and Robert Lister built on Goggin's work and conducted a wide-ranging survey of the ceramics produced in Greater-Seville for export to the Americas and those manufactured in Mexico in the early colonial period (Lister and Lister, 1987). These overviews are based almost exclusively on terrestrial sites, though, and do not benefit from the more specific contexts of shipwrecks sites. Only Marken's (1994) analysis of ceramics expressly from Spanish colonial shipwrecks takes advantage of this strength and offers an understanding of what types of items were used when, and this work helps to better define how ceramic types and forms can be dated.

Conclusions

The archaeology of sixteenth-century Spanish colonial shipwrecks has revealed trends in the design, material culture, and technology of the ships; some specific, some general. By looking at the aggregate

of existing information, a framework emerges for the qualities of Spanish ships conducting business in the early American colonies.

Maritime archaeologist Roger Smith, in his survey of early “ships of discovery,” stated that “ships and guns were the most important tools of technology that made possible the Iberian nautical revolution” of the fifteenth and sixteenth centuries (1993:208). The existing archaeological literature has indeed emphasized these important aspects of early colonial ships, perhaps because these are the things most commonly present on wreck sites. One synthesis of the information found in wooden hull remains documents twelve design features that appear to be indicative of early transatlantic ships (Oertling, 2001). Through the remains of what are mostly lower-hull complexes in varying states of preservation, distinct patterns of iron and wood fasteners, masts often set in an expanded section of a buttressed keelson, floor and futtock timbers joined by dovetail mortise and tenon joints, and flat transoms, among other things, were found to be indicators of such early transatlantic ships.

And, also in support of Smith’s idea, the reporting shows that a battery of breech-loading, wrought-iron artillery – usually between two and four tube guns and six to sixteen *versos* – is another feature common to early sixteenth-century Spanish-American shipwrecks, and is an apparent hallmark of them. Infrequently, wrought-iron *falconetes*, a type of hooped, swivel-gun are found, as are muzzle-loading, wrought-iron *haquebuts*, or hand-cannons, and these rarer types of guns appear to be associated with earlier-dated ships. In the later parts of the century, cast-iron or bronze muzzle-loading artillery might be seen. Other less-consistently encountered weapons on these early ships are matchlock firearms, crossbows, swords and pole arms.

But a ship under sail was much more than just than an armed hull: it was also a multi-faceted community with one or more goals. Success required people and all of the things to move them and their mission forward. The archaeological record also shows that things like storage containers, tableware, furniture, medicine, and food were all necessary for an effective voyage. And the ships have often shown to be physical evidence of two worlds coming together, with European-made items carried westward as supplies or trade goods for the colonies; Native American objects and other American goods on the return. Coins from colonial mints and ingots of newly-mined precious metal, aside from being good indicators of both sailing dates and the areas in which a vessel had conducted business, reflect the transfer of mining technologies and wealth across the oceans.

There are limiting factors seen in many of the Spanish shipwrecks that have been studied, and they cloud the understanding of some of the sites. Many have been badly damaged, usually by intentional salvage, or by accidental dredging, which has destroyed at least part of the archaeological context and left artefact collections “incomplete” (at least beyond what nature had intended for them). Also, few of the known shipwrecks have been identified by name, which only allows for general ideas about when they sailed or their purpose. If the specific goals of the ship are not identified, or it is not known when the vessel sailed or wrecked, important contexts for understanding the remains are removed. Though any early shipwreck has something to say about its times, and general information is important and useful, there is always ambiguity if the specific life-history of the vessel is not known.

Along these lines, the pioneering marine archaeologist George Bass once wrote, “How can an archaeologist of any persuasion make meaningful suppositions about [a] ship or the people who sailed on her or the people who built her or the people who financed her if we don’t have any idea when or where these people lived?” (1982:97). With his question, Bass was expressing frustration with shipwreck studies that tried to say too much with too little information. He was calling for archaeologists to first uncover and share the basics of their subjects of study, with “nuts and bolts” site and artefact descriptions paving the way to provide context for subsequent, broader conclusions. As he saw it, formal pre-excavation research designs are too restrictive because a shipwreck’s qualities cannot be anticipated: A site should be seen and understood before questions are asked of it. From the other end of the spectrum, Colin Martin of the Scottish Institute of Maritime Studies wrote critically of what he saw as myopic trends in maritime archaeology and argued for broader perspectives from shipwreck studies, saying, “The archaeology of shipwrecks, if properly interpreted, can thus address wide-ranging and often exceptionally coherent aspects of the wider world which lay beyond them. But, for all its potential, the archaeology of many post-medieval shipwrecks has tended to be inward-looking and particularistic, its instigators often failing to look beyond the exciting immediacy of their discoveries” (2001). Despite their different perspectives, both men were commenting on the “local” vs. “global” scales in archaeology and what is the best level at which to try to understand shipwrecks.

And indeed, because ships are such complex contrivances, there are many valid ways in which to look at their remains. Keith Muckelroy, in his seminal overview of maritime archaeology (1978), wrote that archaeology can view shipwrecks from three perspectives: 1) as a machine, designed for transportation; 2) as an element within a system, whether that be military, economic, etc.; 3) as a closed community with its own purposes, needs, and mores. These three concepts are still sound positions from which to

view a shipwreck, and they are generally based on a site-specific orientation. Jonathan Adams has built upon Muckelroy's viewpoints by emphasizing the idea of a ship as an extension of the needs and aspirations of a society (2001). In his view, there are seven cross-linked meta-perspectives from which ships and shipwrecks can be interpreted: Ideology (a symbolic expression of social ideas); Technology (means available for constructing the vessel); Tradition (system of ideas of what a vessel is); Economics (the labour and wealth required to produce a vessel); Purpose (intended function as it relates to needs), Materials (the natural or manufactured resources available for construction); and Environment (the intended operating situation for the vessel, i.e. the types of waters it will sail). Adams' views were developed specifically for the hull remains that are encountered at shipwreck sites, but many of the concepts he outlines are relevant to other materials found on shipwreck sites.

The notion of what is the optimal level at which to interpret a shipwreck has not been determined. Orser has identified the problem of scale as a significant one for all modern historical archaeologists (2010). To paraphrase his central idea: How can archaeologists work to understand the wider world while excavating individual sites? He concludes that the household is a logical base-unit of analysis (his is a terrestrial perspective). Multiple units can then be aggregated in various ways to provide knowledge of larger aspects of society. Using this logic, then perhaps the individual watercraft is a sensible, basic measure for the archaeology of shipwrecks. It is at that scale from which the study of the St. Johns wreck will largely take place: The study will define the ship, its materials, and its story. The information about this one ship can then serve as a solid benchmark for any number of wider interpretations.

In sum, the existing knowledge of Spanish colonial ships and shipwrecks of the sixteenth century is significant, but far from conclusive. Archaeologist Filipe Castro, in advocating for greater cooperative study of early colonial-era Iberian shipwrecks, expressed frustration at the situation: "...given the importance of the technical characteristics of the vessels of this period, it is almost incomprehensible how little we know about them;" a situation largely the result of haphazard salvage or the hoarding of data by uncooperative archaeologists (Castro, 2008a). The careful, detailed analysis of the St. Johns Wreck will go far to change the situation. A review of the existing literature shows that it represents one of the few archaeologically-excavated, analysed, interpreted, and identifiable shipwrecks from the early Spanish-colonial maritime system. The wreck is one of the best preserved sites of its type with the largest and most diverse collection of materials. With such a broad and secure amount of information, the St. Johns site can advance the knowledge of the subject – earlier research can be rethought; future research now has an important, new touchstone to build upon.

Chapter 2: DISCOVERY AND EXCAVATION OF THE ST. JOHNS SHIPWRECK

The 1991 discovery of an early historic-period shipwreck on a remote reef in the north-western Bahamas set into motion a multi-year study of the site and its remains. The project was unique in that a private shipwreck salvage company discovered the wreck but instead of utilizing it for commercial profit, turned over the exploration and excavation of the site to a not-for-profit archaeological research organization for scientific and historic investigation and public education. The underwater, archaeological fieldwork at the St. Johns shipwreck site was conducted in six seasons across a period of eight years, from 1992 to 1999.

Discovery

In 1991, the government of the Bahamas granted the Florida-based marine salvage corporation, St. John's Expeditions, Inc., the right to search for and explore submerged historic shipwreck materials within an approximately 1036 square kilometre area of their territorial waters. This area was located along the western edge of the Little Bahama Bank, from the western tip of Grand Bahama Island to approximately 8 kilometres north of Memory Rock (Fig. 2.1). The primary goal for St. John's was to locate a seventeenth-century vessel believed to have been lost within this designated area, but as is usual for any marine survey, a number of sites other than the primary target were located during the search and survey of the area. Of these, one was a shipwreck that contained a number of artefacts that the St. John's crew found curious and perhaps significant. A sampling of these pieces was recovered, but most were left on the bottom as they were found. At this point, St. John's Expeditions halted their work on the site and sought outside consultation to provide an assessment of the wreck.

This writer, on behalf of the Mel Fisher Maritime Heritage Society (MFMHS), visited the site July 13-15, 1991, two weeks after its discovery. Two areas of the wreck had been partially excavated; one shallow hole showed stone ballast immediately below the sand, and another, deeper hole contained a jumble of iron *versos* and the barrel of an iron tube-gun. The iron artillery sat over wooden hull structure, and all appeared to have been originally covered by stone ballast. Pieces of wooden planking were scattered on the sand near the hole, apparently removed during excavation. Evidence of some other, earlier exploration of the wreck was found around the site in the form of concrete blocks, a steel rebar datum, and an encrusted pair of "vise-grip" style pliers. On-board the St Johns Expeditions vessel were artefacts their team had recovered: an iron helmet, an earthenware "olive jar," stone shot, a roll of lead sheeting, ceramic sherds, and a collection of unidentified iron objects, among other things.

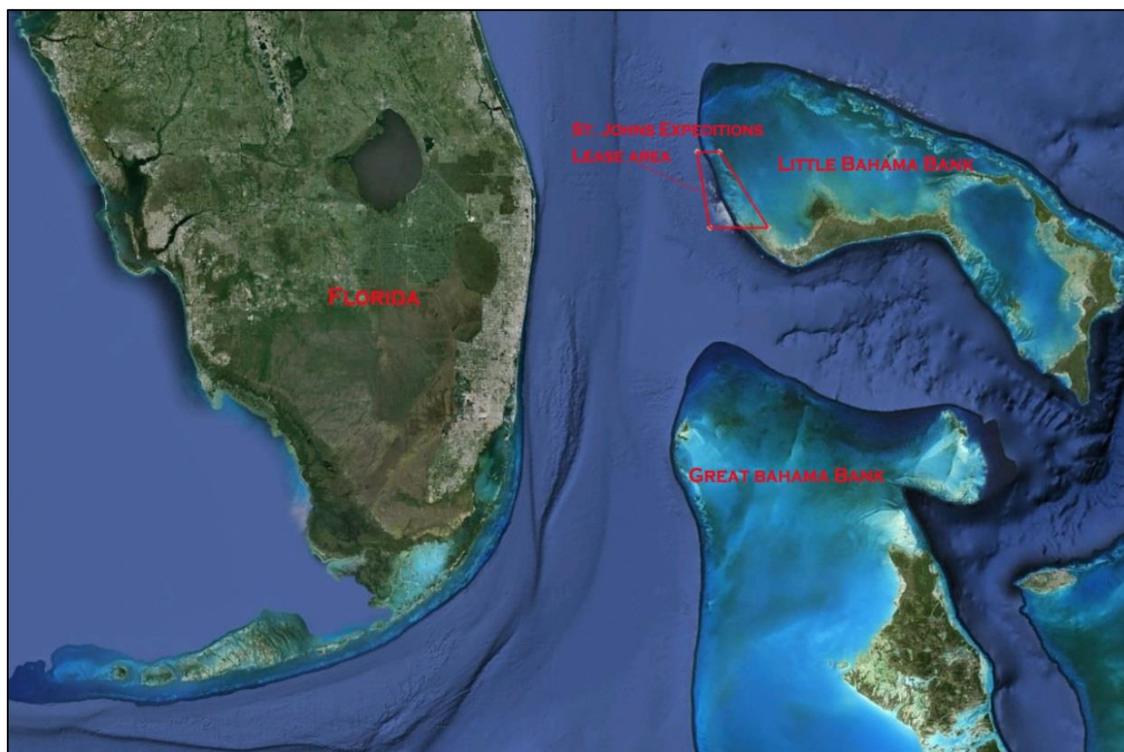


Figure 2.1. Area of the Little Bahama Bank leased by St. Johns Expeditions. (Base image: NOAA).

After the site and artefacts had been examined, a report was prepared outlining that the shipwreck was a Spanish vessel, most likely dating from the first half of the sixteenth century (Malcom, 1991). The report encouraged that no further fieldwork should be conducted by St. Johns Expeditions without careful thought and planning; scientific excavation of the site was urged as the best course of action. After consultation with the Bahamian government, St. John's Expeditions brought the recovered artefacts to the MFMHS laboratory in Key West for conservation and further study.

In August of 1991, the area containing the guns was reopened and examined by Donald Keith of Ships of Discovery, Inc., of Corpus Christi, Texas, and Eugene Lyon of Flagler College, St. Augustine, Florida and a member of the MFMHS board of directors. After examining the wreck, they both agreed that it was a sixteenth-century vessel whose early date made it of great importance toward an understanding of the early period of colonization. Following this visit, the excavated portion of the site was refilled, and no further fieldwork was conducted during 1991.

In December 1991, after exploring various options for the wreck, St. John's Expeditions made the decision to entrust the study of the site to the MFMHS: All of the fieldwork at the site, the conservation of the artefacts, and research would fall under the direction of this writer, working as MFMHS Director

of Archaeology. All of the materials recovered from the wreck and apportioned to St. John's Expeditions by the Bahamian government would be donated to the not-for-profit museum in Key West for research and exhibition. The crews of St. Johns Expeditions were encouraged to visit and contribute to the project at their discretion and to participate in any public relations events.

To ensure a structured study of the shipwreck, a research design was formulated, outlining a strategy to help answer the following questions (Malcom, 1992):

- From what year does the wreck date?
- From where did the vessel originate?
- What was the mission of the vessel?
- What was the type and size of the vessel?
- How was it constructed?
- What was the lading scheme for the vessel?
- What technologies are represented on the vessel?
- Can it be tied into the written historical record?
- What European materials were used to "conquer" the New World?
- How is the influence of the Americas represented on this vessel?
- What is the extent of any previous salvage?
- How did the vessel wreck?

A recording-system based on hand-drawings, photography, and videography was planned to thoroughly document the site and help answer the research questions. An emphasis was to be placed on detail, as the excavation would be the one opportunity to see the vessel as near to its original form as possible.

Site Description

The St. John's Bahamas wreck, as the site came to be called, lies at 26°59'N and 79°08'W, on the western edge of the Little Bahama Bank, approximately 37 kilometres NNW of West End, Grand Bahama Island (Figs. 2.2 & 2.3). The wreck lies in an average of 4.5 meters of water, under a relatively flat and featureless seabed. The nearest point of land is the small and barren Memory Rock, found just over 5.5 kilometres to the southeast. A sand shoal lies to the east of the site, and a shallow, hard reef area known locally as the "Dry Bar" arcs from the south-southeast to the west-northwest of the wreck site. At 0.25 kilometres to the west of the site, the drop-off to the deeper waters of the Bahama Channel begins, where the Gulf Stream current trends northward.

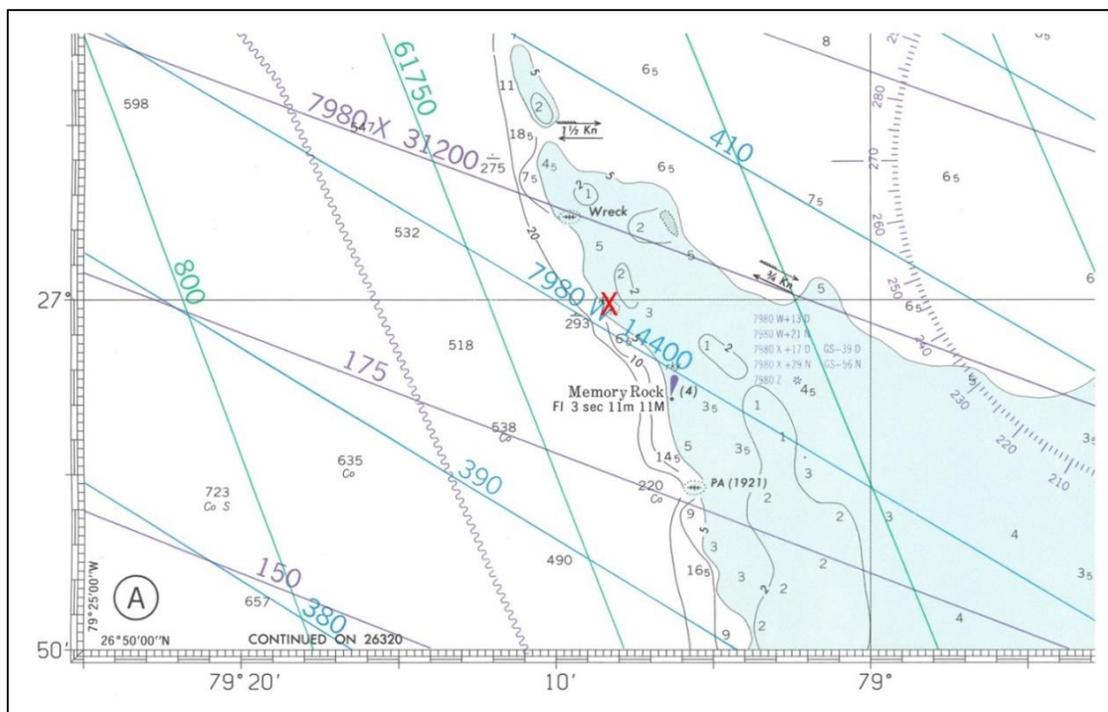


Figure 2.2. The Location of the St. Johns Wreck (Detail from NOAA Chart 26300, 6th edition, 1981).

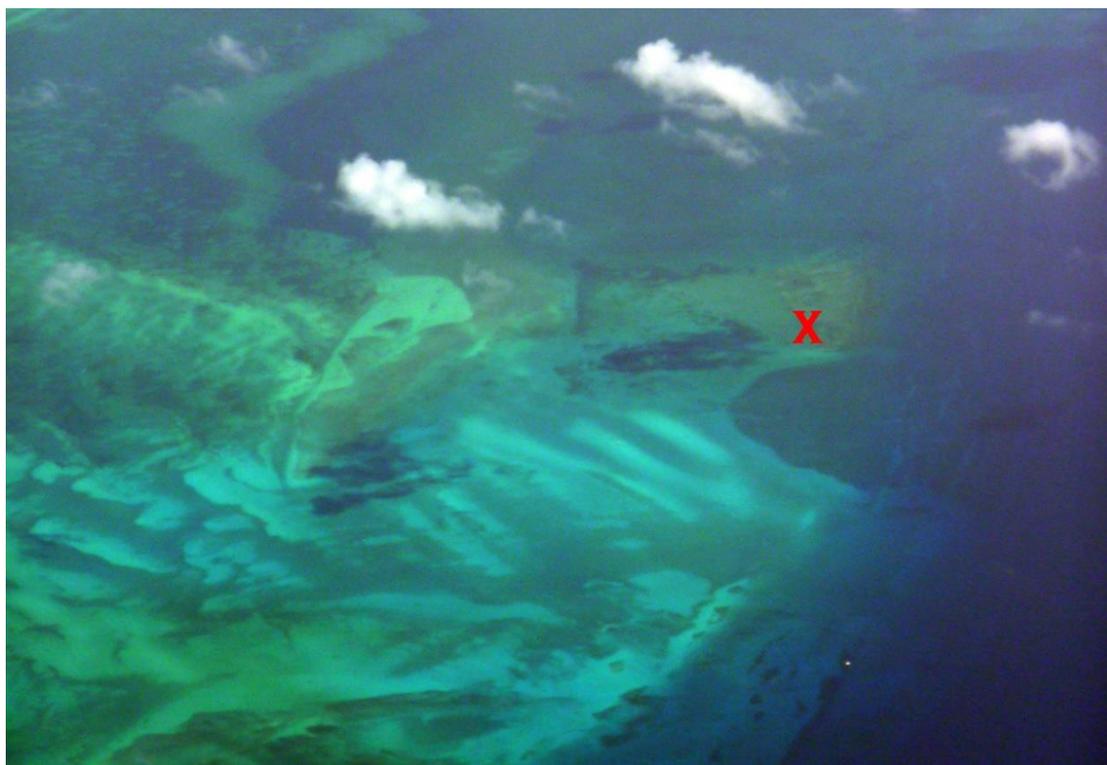


Figure 2.3. Aerial View of the St. Johns Shipwreck Site on the western edge of the Little Bahama Bank, looking from north to south, from an altitude of approximately 33,000 feet.

The remains of the wreck are distributed from the surface of the seabed to two meters below, buried in a matrix of broken coral rubble, shells, and silty calcium carbonate sand. Water clarity at the site is exceptional and ranges between 25 and 50 meters of visibility.



Figure 2.4. The St. Johns shipwreck site before excavation, 1992. (Photo: Dylan Kibler/MFMHS).

Excavation

Before the commencement of the first field season, the organization of the field teams and the excavation strategies were developed, and these remained consistent throughout the course of the multi-year project. Because the site is shallow and well within the range for “no-decompression” diving, a surface-supplied, “hookah” air system was used for diving, and it was able to support five divers on 100-foot long hoses. This allowed the divers to work without the need to replenish their air supply. All of the excavation was done with two 4-inch diameter, water-fed, venturi dredges to remove the overburden from the wreckage. The 16-foot long dredge hoses were made of flexible pipe, allowing for areas up to 5m x 5m to be uncovered in bowl-shaped sections surrounded by sand-spoil berms. Coral rubble too large for the dredges was carried off-site by basket. A system of hand-drawing the wreckage to scale was supplemented by photographs and videography to record what was encountered. The number of field crew varied between three and seven.

1992 Season

For the first season, the 50-foot ocean-going tug *Salvation Rose* was contracted to serve as support vessel (although, after few weeks, it was found to be problematic and was replaced by the 40-foot catamaran RV *Beta*) and fieldwork on the site commenced May 16, 1992, for a period spanning 100

days, 58 of them on-site. During this initial phase of the project 1147 man-hours were spent underwater uncovering and documenting the wreck.

The research plan called for a pre-disturbance survey and testing of the site before the general excavation commenced. Originally, a magnetometer survey was to be performed to gain insight into the distribution of iron remains beneath the sea bottom. It was hoped that this would have a direct correlation with the distribution of the entire wreck. Unfortunately, the intended magnetometer was unavailable to the team at the commencement of the project, and an alternate survey plan was enacted. Wreckage was scattered across the site's surface, and it was thought that this might also be an indicator of how other materials lay below. An area of 33 x 48 meters was delineated to cover the visible wreckage.



Figure 2.5. The excavation of the E5 square begins, 1992 field season. (Photo: Dylan Kibler/MFMHS).

All of these 1485 square meters was examined one by one, and the distribution of stone ballast and artefacts visible on the surface of the seabed was recorded. This visual survey was supplemented by an examination of the area using a hand-held metal detector, and the locations of any readings were also recorded (Fig. 2.6).

The larger part of the wreck materials encountered during this pre-disturbance survey was related to earlier explorations of the site. The ballast proved to be a single layer scattered on top of the sand, not

PRE-DISTURBANCE SURVEY, 1992

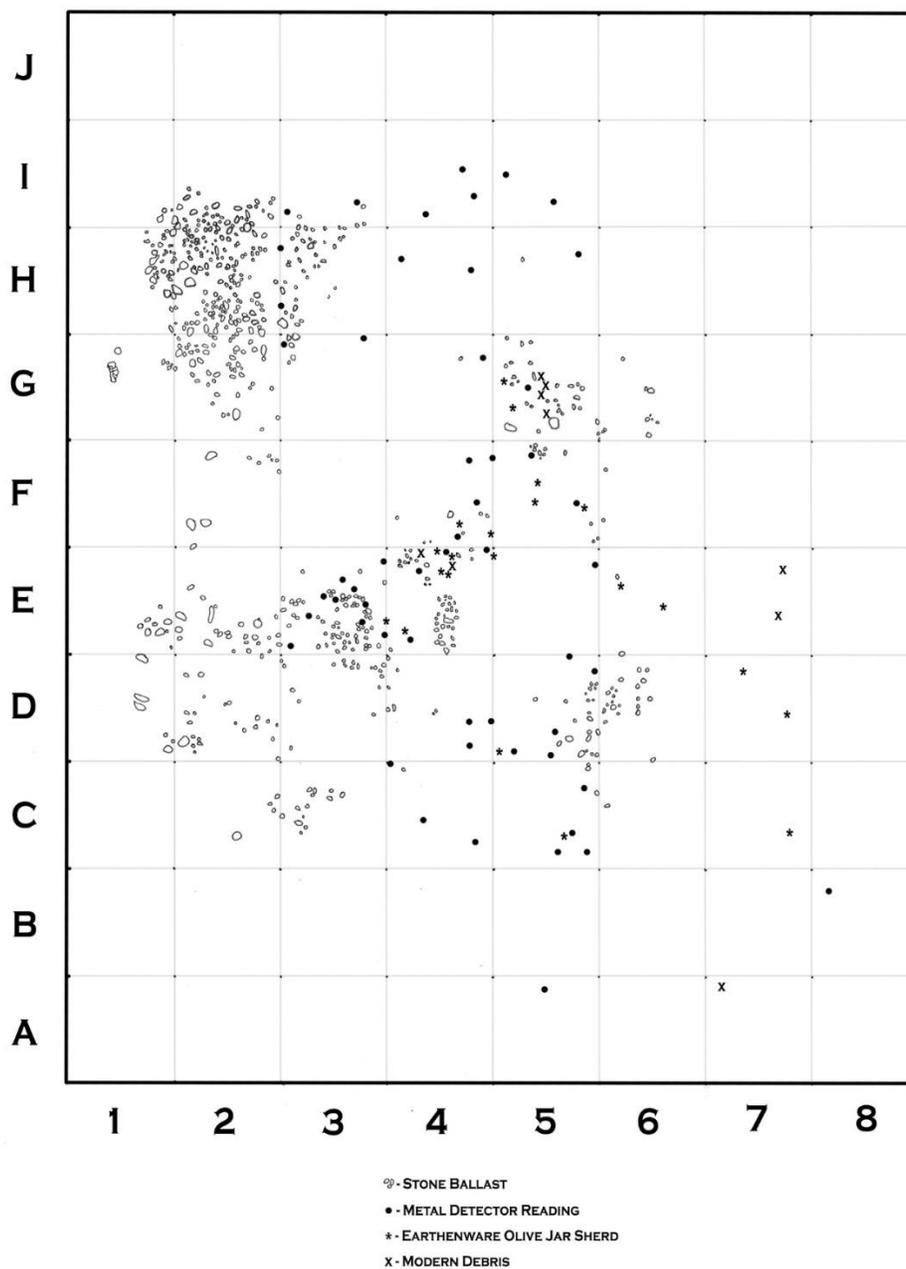


Figure 2.6. Pre-disturbance surface survey, 1992.

the uppermost level of an undisturbed, primary deposit. Distinct primary and secondary marine growth on the stones indicated two periods of exposure; one from some sort of relatively recent removal. Small fragments of wooden hull structure were located across the surface as well, and it is unlikely for these organic remains to have survived over hundreds of years exposed as they were. Many of the metal

detector hits proved to be modern items such as bottle caps, steel banding and bullet casings. Though some of the material might have related to the 1991 excavations of St. John's Expeditions, especially in the area immediately north of the 0 datum, most of it appears to have resulted from some other, earlier salvage effort.

The next step in the excavation plan was for two areas of the site to be designated test excavation units - one outside of the observed wreckage, and another in the area already examined in the previous year's activities. The testing of these areas was twofold: to help determine the sub-surface distribution of the wreck, while allowing the team to tweak and refine excavation techniques to best suit the needs of the site without disturbing too much of any remaining "virgin" area.

A two-meter by ten-meter strip, outside the recorded distribution of ballast and artefacts, was delineated. As most of the known materials were located northwest of the primary, or 0, datum, this test unit was placed to the southeast to determine if any wreckage might be found in this direction as well. This trench was taken down to a maximum depth of 1.5 meters, with no evidence of the site other than a small number of earthenware jar fragments on, or immediately below the surface. Although the bedrock level was not reached during this test, based on observations made the previous summer, it was felt that sufficient depth had been reached to expose any cultural material.

There were also other discoveries of artefacts possibly related to the wreck. Eight ceramic fragments were discovered during excavation for the placement of a mooring anchor, 78 meters north of the 0 datum. These pieces of earthenware jar were embedded below the roots of the sea grass growing there, and appeared to have been there for a considerable time. The hole was approximately three meters in diameter and extended to the bedrock. Additionally, approximately 0.75 kilometres north-northwest from the shipwreck site, St. John's Expeditions crews located an iron anchor of sixteenth-century style and proportions sitting on a hard sea bottom.

Following the initial test excavation, an area encompassing the visible scattered remains was divided into units using a 5-meter grid system. The resulting squares were labelled according to a combination of intersecting letters and numbers, and they were intended to serve as macro-units for the excavation. Of these, the E5 square was chosen as the next area to be tested because it was known to contain the wreckage previously exposed in 1991. The sand overburden from E5 was excavated to the surface of the stone ballast that covered the wreckage. The jumbled pile of versos and bombardeta gun tube were revealed as expected. The larger E5 unit was then subdivided into one-meter squares. Each of the 25

one-meter units within the larger macro-unit was given a letter designation, from left to right, in alphabetical order from A to Y. These one square-meter units were designated the standard excavation unit from this stage of the study (Fig. 2.7).

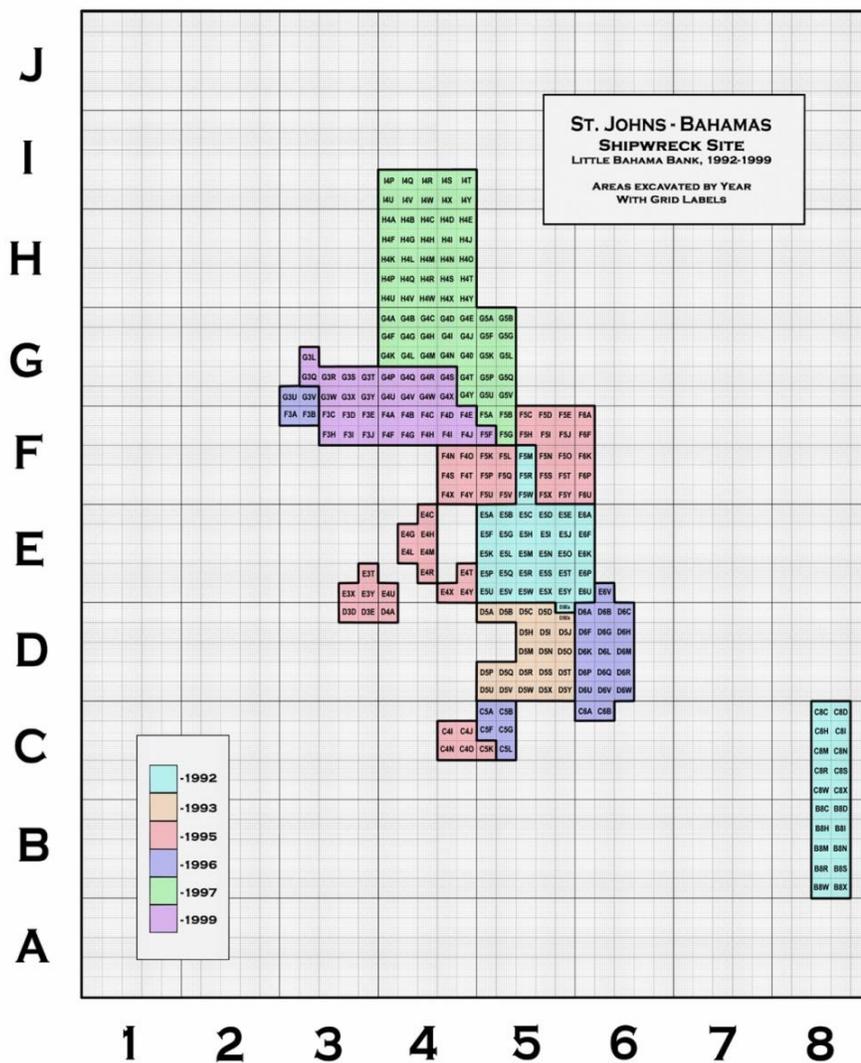


Figure 2.7. Gridded letter-number label system, showing the areas and units excavated during each field season.

As the excavation of units in the E5 square commenced, it was quickly apparent the degree of preservation of E5 was beyond any expectation, with the wreckage appearing to remain much as it had fallen. Within the ballast lens, and immediately below it, was a wide array of artefacts, large and small; portions of this same area were underlain by wooden ship's structure.



Figure 2.8. Excavators clear overburden and expose wreckage in the E5 & F5 squares during the 1992 field season. (Photo: Dylan Kibler/MFMHS).

The excavation of the one-meter units was performed by two-person teams – one carefully removing the overburden with a four-inch dredge, and the other creating a hand-drawing of any artefacts within the space. As each square-meter was excavated, all cultural materials, with the exception of stone ballast, were plotted to scale. Plastic sheet forms, pre-printed with a 1:5 scale version the excavation grid, were used by the recorder to document each unit (Fig. 2.9). Because of their large numbers, iron nails or spikes, earthenware olive jar sherds, or fragments of barrel hoops, were drawn and then tagged and collected by group within the unit where they were found. All other artefacts were individually tagged with a unique number and also drawn in situ. The unit drawings were made with pencil and upon completion were brought to the surface, rinsed, dried, and archived. A log of the day's encountered objects was updated each evening. The artefacts removed from the excavation units were stored either on-board the work vessel, or in a reserve area on the bottom, depending on size, fragility, and particular needs.

Additional measurements were recorded, such as the distances between the large artefacts like artillery and chain-plates. The wooden ship's structure was carefully recorded in situ, photographed, and



Figure 2.10. Overview of the E5 excavation area during the 1992 field season. (Photo: Dylan Kibler/MFMHS).

All the 25 sub-units of the E5 square were excavated to completion in 1992, as were selected sub-units from the D5, E6, and F5 squares. Combining these with the initial test trench in squares B8 and C8, a total of 54 square meters were examined. A number of notable features of the site were discovered during this phase. Besides the re-exposure of the guns seen previously, two more wrought-iron gun tubes were located, along with a considerable amount of associated shot. A large area of intact, but abraded hull structure was found in the western half of E5. It was found to be oriented at a bearing of 332 degrees, and appeared to continue into other, unexamined areas of the site. Eight iron chain-plate assemblies, still lined in a row, were uncovered at the eastern extreme. Most importantly, it appeared that little human interference had disrupted the integrity of this area of the wreck; much of the material was lying much as when it originally fell.

The test excavation of E5 showed that the team had struck into the heart of a surprisingly intact wreck site, and it became evident that any further work would expand from this area of the wreck to best achieve the goals stated in the research design. The excavation techniques were very-well suited to the needs of the study, effectively uncovering the site with good control and allowing for detailed documentation of the wreckage.

There were 563 individually tagged artefacts recovered from the St. John's Bahamas wreck in 1992, as well as many 100's more of earthenware jar sherds, iron spikes, and sections of barrel hoop. These recovered artefacts were placed in storage on Grand Bahama Island until their release by the Bahamian government to the MFMHS laboratory in Key West for conservation. The artefacts were transported to Key West in March of 1993.

1993 Season

In the summer of 1993, the MFMHS team returned for additional fieldwork at the "St. John's Bahamas wreck." Again, the R/V *Beta* was contracted to serve as support vessel. The plan was to expand upon the previous season's efforts, while utilizing the same excavation and recording methodologies, which had proved to be quite effective.



Figure 2.11. Wooden hull remains are examined during the 1993 field season. (Photo: Dylan Kibler/MFMHS).

The D5 square, immediately to the south of E5, was selected as the next area to be examined. The previous year's work showed that a substantial amount of hull structure continued into this area, and it was felt that by revealing it, a firmer understanding of the orientation and design of the ship could be had. Additionally, the undisturbed area of artefacts, especially a collection of weaponry, appeared to continue southward into the D5 units.

Overall, and as seen in the previous year, there was limited evidence of any significant disturbance of the area. Only the upper levels along the western edge of the square exhibited any sign of earlier excavation, mostly in the form of ballast stones having been moved from their original context. The strongest proof of an earlier investigation of the wreck was the discovery that the steel rebar used as the 0 datum since the site's discovery was an L-shaped piece driven into the mouth of a *bombardeta's* breech chamber. The chamber was the uppermost in a feature of many such pieces fused by concretion into a large, single mass.

Notably, the 1993 excavations showed a dearth of materials in the extreme southeast corner of D5, apparently revealing the limit of the site in that particular direction. As expected, the hull structure did continue from the previous units, into the D5 square. As seen in the previous season, these hull remains consisted of lines of exterior hull planking, with badly eroded framing components (Fig. 2.11). The structure terminated at the southern edge of the D5 square. Other forms of wreckage, especially earthenware jar sherds, appeared to continue on into the adjacent areas to the south.

Using the now-established system of one-meter units to record the horizontal distribution, in 1993, twenty-one of the twenty-five square-meters of D5 were excavated in 551 man-hours, over 25 days, with 139 individually-tagged artefacts recovered. More olive jar sherds, barrel hoop fragments, and iron fasteners were also collected. All of the stone ballast from unit D5I was brought to the laboratory as a sample for later study.

1995 Season

No fieldwork was conducted in 1994 because of concern that it would only create a large backlog of recovered materials. The time was spent conserving, documenting, and understanding what had already been collected from the site.

By the summer of 1995, though, the MFMHS team was once again prepared to continue field research on the St. Johns wreck. A new boat, the 42-foot M/V *Rattle and Hum* was contracted to serve as research vessel. Previous explorations of the wreck had taken place somewhere along one side of the ship's hull; the structure that had been encountered was exterior planking sporadically intersected by degraded framing fragments, revealing little towards understanding exactly where on the ship fieldwork had been conducted. One of the primary objectives for the 1995 season was to locate the keel of the wreck to better determine specifics about the layout of the site, as well as the ship's size and construction. Another key goal was to expand into areas to the north of square E5. As the fieldwork

proceeded, the degrees of disturbance for different areas of the site were revealed. Excavations within the F5 and F6 squares revealed more intact, undisturbed wreckage, but, as work progressed eastward into the F4, E4, and D4 units, it became apparent that they were areas that had been exposed sometime before, as the compact, fine, silty sand normally found in and around undisturbed areas of the wreck was gone, replaced by coarser, loose sand.

A mound of coral-concreted ballast was in the E4 square, but significant gaps were found in it where stones had been removed. In these gap areas, the structure appeared to have been previously exposed, with all of the framing components and some of the hull-planks removed or skewed. There was no pattern to this disturbance, which occurred at varying levels of the deposit. An outline of the extent of disturbance was noted, and the system of sub-units was then employed to record the artefacts. Dislocated wooden structural components were collected and recorded separately.

In the effort to find the keel, the position of the chain-plates, east of the known structure, was utilized to delineate an area to the west with a high probability of its location. Fortunately, when that area was uncovered, a small portion of what appears to be the key structural component, though badly degraded, was found in its original context. But it was only a fragment, and additional excavations placed along the line of this feature yielded no evidence of the keel's presence anywhere else.

Other notable discoveries revealed during this field season were a section of a copper cauldron; a scatter of bombardeta breech-chambers extending southward from those encountered previously, and an area in the F6 square where the small, fragile remains of seeds and insects were discovered. Crews from St. John's Expeditions discovered a very large, isolated mass of concreted ballast roughly 50 meters north of the 0 datum; apparently removed from the site in an earlier salvage effort.

It should be noted that 1995 was one of the busiest years on record for tropical weather activity; the project was twice-interrupted and suffered significant set-back because of this. The site was hit directly by the centres of both hurricane "Erin," and tropical storm "Jerry," resulting in areas of the site having to be excavated three times and the loss of some equipment, while creating much stress and frustration for the crew (Fig. 2.12).



Figure 2.12. A tangle of dredges, hoses, and baseline found in the partially refilled site, after a hurricane, 1995. (Photo: Dylan Kibler/MFMHS).

During the 1995 fieldwork, 55 square meters were excavated to completion, requiring 863 underwater man-hours over 36 days. Along with olive jar sherds, spikes, and barrel hoop fragments collected by each square-meter unit, 251 individually tagged artefacts were recovered. The stone ballast from unit E3T was recovered as a second sample.

1996 Season

The excavation for 1996 focused on expanding the site to both the northwest and the southeast from its known limits. An area of four square meters was opened to the northwest, in line with what appeared to be the remnant of keel seen the previous year. The four units were set apart, on their own, not adjoining with any areas that had been previously excavated. This was done to see if there was any further evidence of this important structural feature and as a test to understand the situation of wreckage in that relatively distant area. This north-western excavation uncovered no further evidence of the keel, or any wooden hull structure. As the excavation started, fragments of dislocated, broken hull-planking were found in the uppermost layers of sand, more evidence of an earlier salvage operation. But below this damaged zone, there was the original, untouched layer of wreckage that contained a significant portion of a barrel hoop, a large iron bar, pieces of wooden dunnage, ballast, and a variety of ceramic fragments (Fig. 2.13).

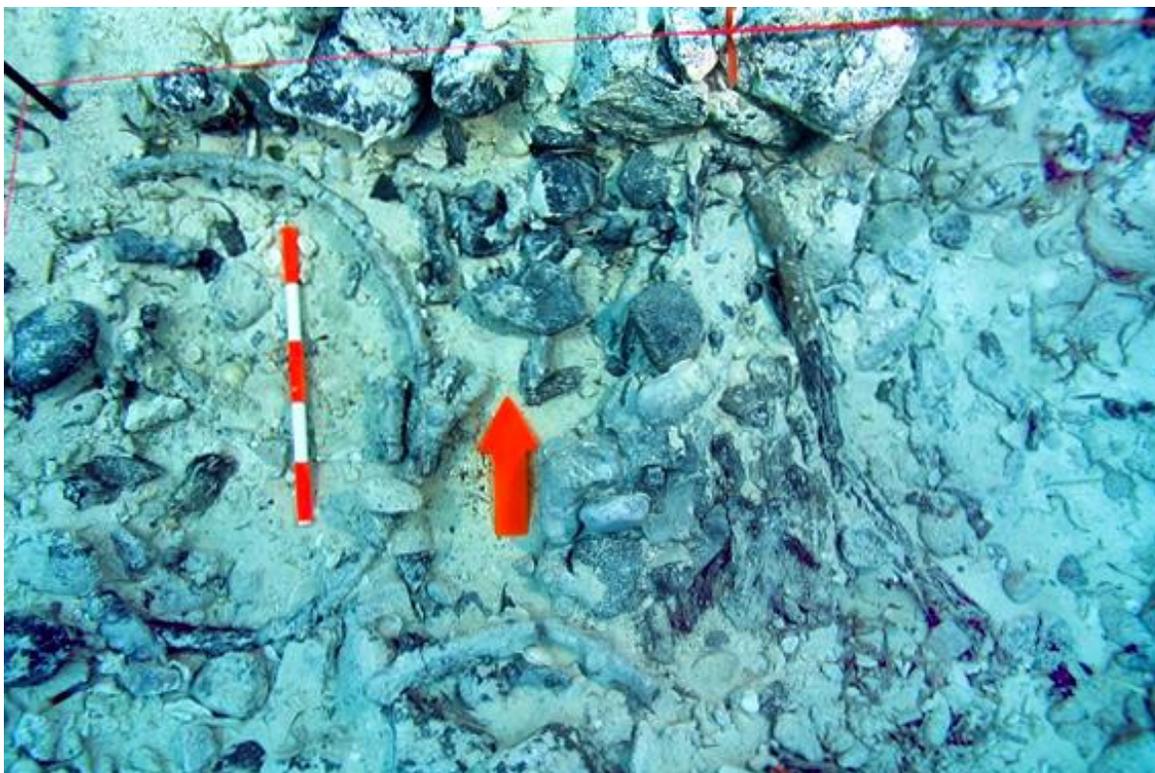


Figure 2.13. An iron barrel hoop and wooden dunnage in the G3 square, 1996. (Photo: Dylan Kibler/MFMHS).

In the south-eastern portions of the site, two clusters of units in the D6, C5, and C6 squares were also examined in this same season. The four units in the C5 square were plotted along what would have been the southern extension of the hull remains that were seen in the 1993 excavation of square D5; it was thought there might be additional wooden structural elements there. Also, the units were immediately east of where multiple wrought-iron breech chambers had been found the previous year, and it was thought more of these might be found. Interestingly, neither hull nor breech chambers was found. Instead, these southern units were densely-filled with many hundreds of fragments from broken earthenware olive jars.

A third group of units was excavated in the eastern portion of the site, within the D6 and C6 squares. This area was uncovered to build upon the discovery of rigging elements and weapons discovered near there in 1992. There was little found there indicative of additional rigging or hull structure. But the units did contain a large number of weapons – primarily the steel prods of crossbows and the iron heads of a number of pole arms. So many so, that the area came to resemble an arms locker.

In 1996, twenty-seven square meter units were excavated in 617 man-hours, over a period of 41 days.

1997 Season

For the 1997 season, a new vessel was chartered for use as a research platform - the 60-foot, steel-hulled crew boat M/V *Discoverer*. This vessel made for an exceptionally stable workplace and allowed the team to stay on site through most weather conditions: Six weeks were spent on site, without interruption, during this excavation. The goal for the season was to explore the northern end of the wreck, hopefully revealing evidence of what was thought to be the bow of the ship. Units to the north, within the I4, H4, G4, G5, and F5 squares were excavated.

Based on the pre-disturbance survey, the northern limit of the excavation was set at 27 meters from the 0 datum. It was thought this would be enough to encompass any remains of the wreck, especially intact elements of the ship's hull. And indeed it was. The excavations appear to have revealed the extent of the wreckage in that direction. Some of these northern areas had been explored by others at some earlier time; a snorkel mouthpiece, aluminium "Dr. Pepper" soft-drink can from the 1980's, and a ballast stone with a polyester line attached to it, were discovered to indicate this. Fortunately, an old, buried sea grass bed was below this modern debris, indicating that any disturbance was superficial. The units that were explored all revealed wreckage in its original context, though some units showed surface disturbance. One of the northernmost units – I4R – had been completely disturbed, though, with no evidence of any untouched, "virgin" deposits.

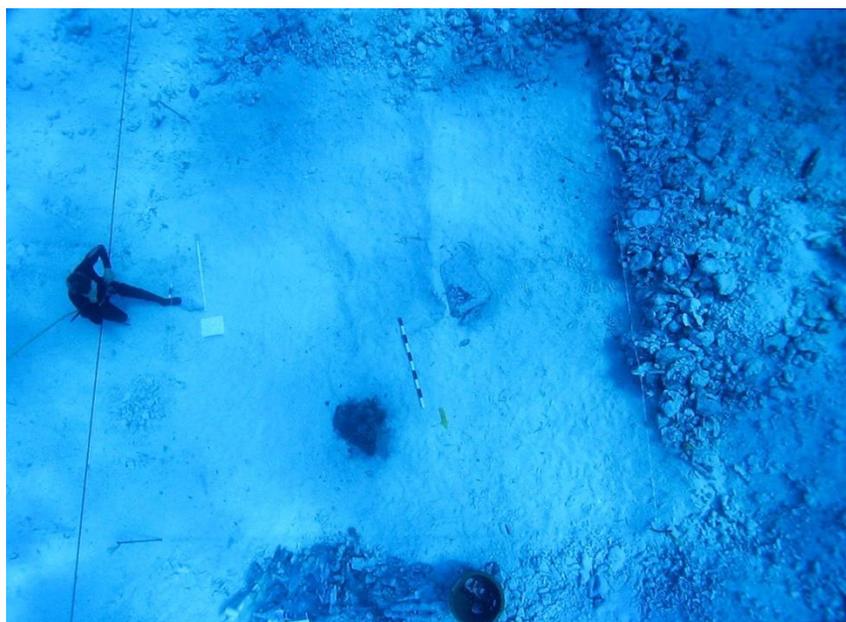


Figure 2.14. Overhead view of excavated areas of the G4 and H4 grids, showing two copper cauldron panels *in situ*. (Photo: Jeff Keiser/MFMHS).

Among some of the more significant discoveries made in this northern area were an isolated wrought-iron verso rail-gun, two panels from a large, riveted, copper cauldron, woodworking tools, a fish spear, and a scattering of large iron and stone shot. Two significant wooden structural elements were found, but, unfortunately, both had been removed from some other area by earlier explorers of the shipwreck. One appeared to be a section from the keel, and the other was a large fragment of hull planking with “ghosts” of encrustation that revealed the outlines of the frames or futtocks it once attached to.

There was a noticeable drop-off in the density of both artefacts and ballast as the excavation carried northward; this was especially true of the northernmost 5 meters. The ballast was also considerably thinner along the eastern edges of this area. By the end of the season’s work, it was felt that the limits of the core-area of the site had been reached in these directions. The 1997 season was one of the most productive, with a total of 65 square-meter units excavated in 748 man-hours, across 37 days.

1999 Season

The *M/V Discoverer* was once again used as the support vessel. The limits of the ship’s wooden hull remains had been determined to the east, west, and south, but not to the north. The aim for the 1999 season at the St. Johns Bahamas Wreck was to determine exactly where the northernmost end of the hull might be, to fill gaps between some of the areas that had been explored previously, and to further document the distribution of artefacts in the north-western areas of the wreck site. Also, the remainder of the artillery first discovered in 1991, was to be recovered.

The first order of business was to uncover the pile of versos and one bombardeta to prepare them for recovery and offer a good reference point for divers. After this was done, units in the G3, G4, F3, F4, and F5 squares to the northwest of these guns were excavated.

A section of concreted ballast was uncovered, and beneath it was a section of intact hull structure. To the northeast of this, though, it appears that an earlier prop-wash excavation took place and managed to destroy part of the structure – even blasting a hole through it. Bits of dislocated wood were mixed with coral rubble and ballast in the layers above the site. For the larger part of the area, though, any damage was only to the upper layers of the seabed: once the site level was reached, there was intact hull structure and undisturbed artefacts.



Figure 2.15. Measuring the ballast mound for placement of 1-meter units, 1999. (Photo: Dylan Kibler/MFMHS).

As hoped, the northern limit of the ship's hull was encountered in the 1999 season's excavations. These wooden remains were very badly worn, and, like all the *in situ* hull that was seen, they consisted of planking remains with portions of framing components attached to the inside faces. A second area of intact planking was found to the east of this, and between these two features was a gap that was almost certainly damage from some earlier salvage effort.

The northwest extreme of the 1999 excavation, unit G3Q, was where the north-eastern terminus of the hull structure was found. The unit also contained pieces of wooden dunnage, a continuation of that uncovered in adjacent units in 1996.

The artefacts encountered in these units consisted of a many types of fasteners, fragments of lead sheeting, shot (large and small), and fragments from a variety of ceramic types. The remaining wrought-iron artillery first encountered in 1991, three *versos* and one *bombardeta*, were recovered as planned.

The 1999 field season was cut short by the arrival of Hurricane Dennis. But, despite the shortened schedule, the effort was successful and the goals of the project were met. In 530 hours, over a period of 21 days, 33 square-meter units were excavated. This was the last fieldwork on the site.

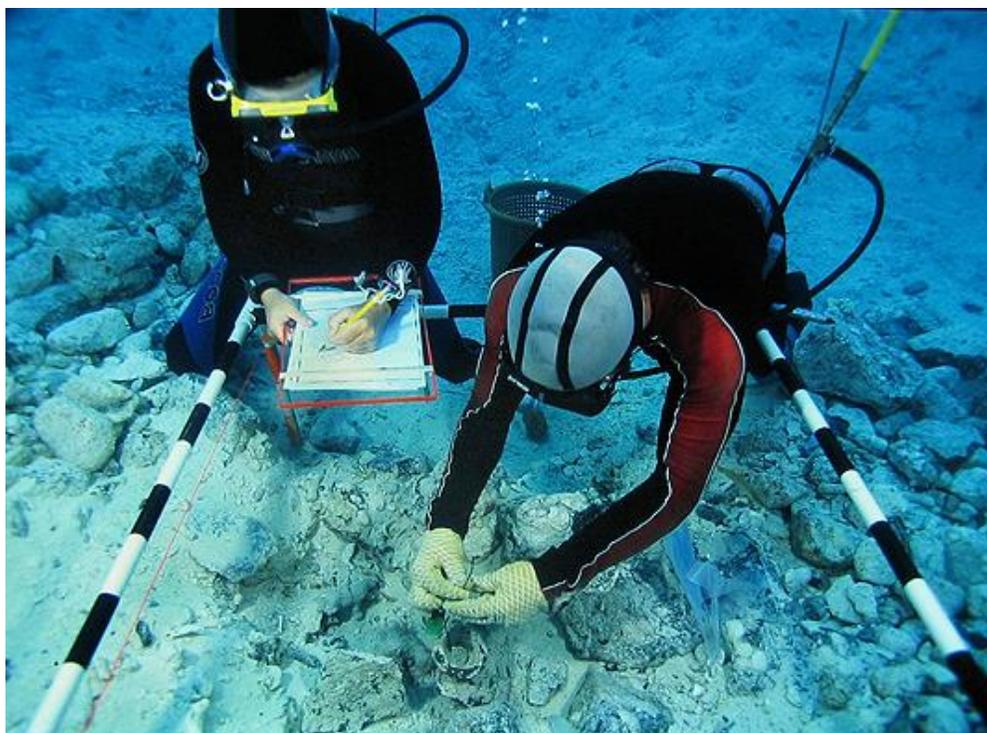


Figure 2.16. Excavators plot and tag the neck of an earthenware jar, 1999. (Photo: Dylan Kibler/MFMHS).

Early Salvage

From its 1991 discovery by St. Johns Expeditions, with evidence of disturbed areas and the presence of modern objects such as tools and markers, it was clear that the St. Johns Bahamas Wreck had been explored before. The identity of the earlier salvagers was not apparent, and there was no one who had publicly reported the work. But examination of correspondence filed with the government of the Bahamas shows it was most likely the work of two groups who worked under a salvage lease in 1980 and 1981. The leaseholder was a company named Eco-Tech, headed by Robert Bouchlas of West Palm Beach, Florida, but the majority of the field work appears to have been conducted by a sub-contractor, Expeditions Unlimited, of Pompano Beach, Florida, and headed by Norman Scott.

Correspondence by Scott to Bouchlas in February of 1981 relates the discovery of a *“virgin wreck underneath the sand, which to the best of our knowledge and opinion, has not been touched in a long time, if ever. The fact that it was under 4 – 5 feet of sand with eel grass, and that the ballast was fused together, is indicative of this. The broken pottery shards indicate either Spanish or Portuguese origin. To date, the absence of ships’ rigging, etc., puzzles us”* (Scott, 1981a). On the same date, Scott wrote to the Bahamas Ministry of Transport and similarly describes the *“virgin”* wreck found the previous fall

“covered by 4-5 feet of sand with slow growing eel grass growing on top of it. In removing the overburden, we have found a large ballast pile which was fused together.” He later noted, *“...the virgin wreck has not been explored and needs to be worked as it may be productive”* (Scott, 1981b). Scott also lists a group of “junk” artefacts that were recovered for diagnostic purposes during their expedition, including *“coins, broken pottery shards, cannon-like object, three mast rings, lead roll sheathing, wood planking, cannon balls, spikes, and fittings.”* These artefacts appear to have come from a number of different shipwrecks Expeditions Unlimited explored that year.

In 2009, Robert Bouchlas was contacted by this writer to discuss the shipwreck work his group performed in the Bahamas and the artefacts that they recovered. Unfortunately, Bouchlas was not comfortable about doing so, and no meeting took place.

In 2013, Norman Scott was contacted by telephone to discuss the same subject; he did not immediately remember having worked with Bouchlas, though he did find something familiar in the story; Scott called his associate, Mr Jerry Lee, to the line, and he had a very good recollection of what happened (Scott & Lee, 2013). According to Lee, their team was surveying the areas around Memory Rock with a magnetometer, looking for shipwrecks, and at night they liked to anchor behind the “Broken cannon” wreck found on the Dry Bar Reef. They had two boats, one steel-hulled, and another of fiberglass. Mr Lee was the “mag man” and one morning decided to test the magnetometer before the team began surveying. He turned the machine on and noticed that it was showing a signal immediately below the boat. He asked the steel-hulled boat to leave the area to make sure it was not the source, but he still got a signal. They dug at the spot, but divers could not determine what was generating the signal. Lee dove and saw the top of a ballast pile, and he brought up a large stone. Shortly after this discovery, they found an iron, cannon-like object – ringed with reinforcing bands every 6 inches, about 2 ½ feet long, 6 inches in diameter, with a 2-inch diameter bore. The Expeditions Unlimited team believed this piece to be artillery from the 1500’s. There was also wooden hull structure seen just below the ballast, and the wood looked to have been burned. Sometime later, Lee believes it was July of 1981, they found three pieces of silver at the site – crude, “sand cast,” partially melted, and unmarked; the largest piece was ca. 4 pounds (Fig.2.17). Lee left the day after the silver was found and the wreck was left to a Capt. Tom Webb, who continued to work at the site, but it is not known what he did or what was found. As far as Lee knows, the banded “cannon” and the silver pieces were all that were recovered from the site (all of the other “junk” objects mentioned in Scott’s earlier letter came from other shipwrecks in the area). Two of the silver pieces from the site went to The Bahamas government and one to Expeditions

Unlimited (it was stolen from their office in 2011). It is not known what happened to those that went to The Bahamas. Lee believes that Robert Bouchlas has possession of the banded cannon piece, but was not sure. He did note that last he knew, it was not conserved and had deteriorated badly.



Figure 2.17. Silver recovered by Expeditions Unlimited from a shipwreck on the Little Bahama Bank, 1981. (Photo: Jerry Lee/Expeditions Unlimited).

Though no site location or field data was formally recorded by Expeditions Unlimited, the outline of Lee's story certainly meshes with the place of the St. Johns wreck and what was seen during this writer's study of the site – its place "behind" the Dry Bar, with evidence for seemingly random digging through the ballast, with some damage to the ballast mound and wooden hull structure, but little to no disturbance in areas where the majority of artefacts were located. Fortunately, these early efforts, whoever did them, missed the heart of the wreck and left the vast majority of wreckage *in situ*. Damage was certainly done, but it was nowhere near so bad as to hinder a meaningful, detailed field study.

Conclusion

The excavation of the St. Johns Bahamas Wreck was a much bigger project than originally anticipated, but the revelation of a substantial shipwreck came with the added time and labour. Using teams of three to five divers, slow-paced excavation techniques, and large amounts of diving time worked well. Small, water-fed suction dredges allowed for safe excavation and detailed documentation of the wreck and the objects it contained. Artefacts, ranging from large iron artillery to things as small as seeds and insects, were mixed in and below a stabilising layer of stone ballast. A large portion of the ship's hull was found buried beneath much of this. The site had been located and explored by an earlier salvage

venture, resulting in some damage, but this study was not too adversely affected by that work, and it was learned that the vast majority of the site had not been seen since the ship went down.

The wooden hull remains appeared to constitute the larger portion of the ship's side: at one side of the site was the lowest extreme of the ship, and at the other was a row of iron chain-plates, the rail-level attachments for shroud-lines that ran to the top of a mast. Virtually all of the undisturbed, *in situ* hull structure consisted of planks lined side-by-side and end-to-end, with portions of framing components running perpendicularly along their inside faces. The planking ran for a maximum length of 18.8 meters (61' 8"), and was 7.5 meters (24' 7") at the widest. The ship's remains appear to be largely contained to the examined areas, and at the north, west, south, and southeast, the wreckage stopped. Towards the northeast, though, there were areas left unexcavated that looked to contain more ballast and artefacts.

Many items were found on the site largely as they were arranged when the ship was afloat. The large gun barrels were aligned with the length of the ship, indicating they were likely in storage below decks. The artillery was found in two distinct groups, with a pile of smaller rail-guns were mixed with a single, large, wrought-iron tube, and another two large gun tubes were 2-3m to the east of these. A concentration of large cannon shot was between the groups. This arrangement of guns and shot into three groups looks to have been a purposefully balanced load – one mass to port, one on the centreline, and another to starboard – arranged to minimize pitch and roll of the vessel. Interestingly, a single swivel-gun was found 10.4 meters to the north from the centre of this arrangement.

The collection of artillery is found at the approximate middle of the length of the site, indicating the guns were placed amidships, near the mainmast or just forward of it. Considering that the chain-plates, found lined in a row to the south of the guns, would have been mounted just aft of the mast, it would imply the shipwreck is oriented with the bow to the north and the stern to the south, and that the excavation uncovered the starboard side of the ship.

Multiple breech chambers for the larger guns were found at the southern end of the ship, and remains of a copper cauldron (presumably from near the galley area) were at the northern end, showing what appears to be a conscious effort to have a fire-oriented space far away from where the gunpowder was kept. A concentration of weapons, including crossbows, arquebuses, and pole-arms, was contained in an area of roughly 8 square-meters, just to the south of the long gun tubes, looking to have been some sort of an "arms locker." Other features, offering insight into strategies for the storage of cargo, were a



Figure 2.18. St Johns Wreck Site Plan, 1992-1999 (Drawing: Corey Malcom & David D. Moore/MFMHS).

heavy concentration of earthenware olive jar fragments towards the lower aft end of the wreck, and an area with wooden dunnage and barrel remains in the area of the forward hold.

One category of material noticeably absent from the wreck was treasure; only a very small number of corroded silver coins and silver nuggets were found. Also lacking on the site was evidence of human death: There were no bones, no teeth, no jewellery, and no durable clothing elements such as buttons or buckles – all the sorts of things that should be left when people perish on a shipwreck.

Areas of ballast along the western edge of the site were removed and scattered sometime before St. Johns Expeditions 1991 encounter with the wreck, and modern tools and other debris from these efforts were found during the excavation. Some of the hull structure was found to be damaged, including a hole blasted into the wooden remains found at the northern end of the site. The salvagers had also removed areas of ballast from the western areas of the site, over the structure. One large clump of this concreted ballast was found removed well to the north of the wreck.

In general, though, the surviving remains of the ship were intact and in their original positions; somewhat surprising considering the site lies in shallow water in an area prone to destructive hurricanes and tropical storms. Evidence from the fieldwork suggests that the ship likely struck the nearby reef and at some point settled inside of it, eventually rolling onto its starboard side. In this scenario, the upper side of the ship was exposed to the elements and decayed over time, but the lower side was covered by the seabed and preserved. When the ship went over, the stone ballast in the hold slumped over, too, covering and intermingling with many artefacts, helping to hold them in place and maintaining some of the internal arrangements of the ship. This stabilisation also maintained good preservation of the items, and things as small and fragile as insect parts were found buried in the wreck's silty sand.

The careful field documentation of the St. Johns Bahamas site has proved to be a crucial first step in understanding the nature of the ship and its wreck. Coupled with the analysis of the many and varied objects found there, the site provides an informative look into Spain's sixteenth-century transatlantic system, as well as the realities of this particular vessel and for those on-board.

Chapter 3: HULL STRUCTURE, RIGGING, AND BALLAST

Overview

When the St. Johns Wreck was first discovered in 1991, one of the significant features seen on the site was glimpses of wooden hull remains. Some were displaced fragments found scattered about, apparently the result of the St. Johns excavation or an earlier salvage effort, but other remains were seen below the cluster of wrought-iron artillery, indicating a section of the hull was likely to be present and preserved in its original context. Ultimately, after the completion of the excavation, *in situ* hull remains were shown to span a maximum length of 19.55 meters (64' 2") and 7.4 meters (24' 3") at the widest. Some rigging elements were also present. When these uncovered remains are examined and compared to the historical and archaeological record, the area of the ship these pieces represent, how the vessel was rigged, and its general size can be determined.

The submerged hull remains were quite fragile, and they were not recovered. Only rarely were selected examples even moved during the excavation, as they would not have fared well by any such disturbance. The *in situ* wooden remains were documented via drawings, photographs, and videotape. Because those pieces were not moved, this meant that throughout the excavation it was generally the upward-facing surfaces that were mapped and measured. This gave a view of the remains as seen from inside the ship; the exterior surfaces were rarely seen. At the end of each excavation season, whatever hull remains had been encountered were reburied as found. The wooden remains of the St. Johns Wreck remain on site today.



Figure 3.1. An area of wooden hull structure and stone ballast at the St. Johns wreck, 1993. (Photo: Dylan Kibler/MFMHS).

During the archaeological examination of the site, the shipwreck was uncovered with four-inch venturi dredges and ballast was removed by hand, exposing the hull remains, which were further cleared of sand by hand-fanning, the use of whisk-brooms, and the periodic use of a 2-inch airlift. Because the site was excavated in sections that varied from year-to-year, the entire run of the hull structure was never seen at one time. It was only at the conclusion of the project, when all the field notes could be joined, that an overall image of the wreck's hull emerged.

The excavation also showed that there were areas where the hull had been disturbed and damaged by previous salvage. This meant there were gaps in the continuity of the structure and numerous fragments of wood dislodged from their original context were found scattered in the sandy layers above the wreck. These fragments, mostly small pieces of hull planking, were collected, measured and drawn, but it has not been possible to determine their exact placement on the hull. Two larger wooden components were found at the northern end of the site – a large piece of hull planking and a section of a centreline timber. Both pieces had also been removed from their original context.

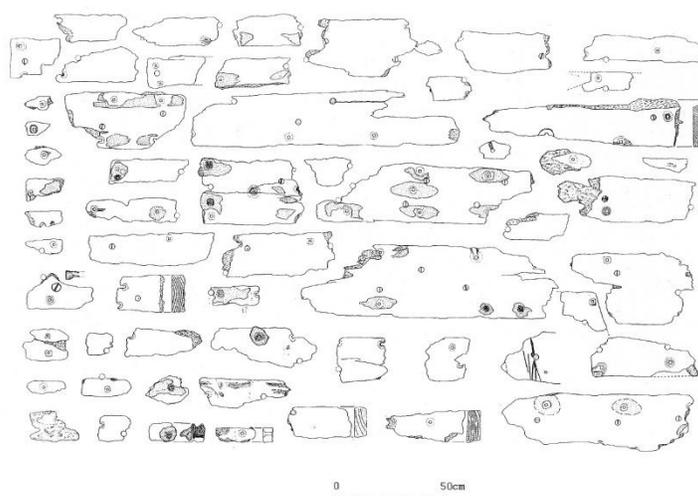


Figure3.2. Wooden Hull Fragments displaced by early salvage efforts, 1992. (Drawing: David D. Moore/MFMHS).

The *in situ* remains – mostly hull planking and fragments of framing components – were poorly-preserved but extensive, and they represented areas of the ship not generally seen on similar shipwrecks. The remains were flattened by decay, and there was no curvature to the hull. There are some 21 strakes of planking represented and approximately 41 framing components that were largely missing and recognizable only by the lines of fasteners indicating their former positions. A line of shroud chains and a possible fragment of an associated wale represent a portion of the ship's standing rigging.

Planking

When the wreck was first encountered by St. Johns Expeditions, they excavated a hole to determine the source of a magnetic anomaly. This revealed the first evidence of the St. Johns ship itself – one broken but well-preserved piece of hull planking that exhibited a combination of iron spikes and wooden fasteners (treenails); its exterior surface slightly charred, most likely evidence that it had been heat-bent to fit the ship’s framing. The piece was 28 centimetres wide and 6.5 centimetres thick. At the bottom of the hole, more, apparently-intact hull remains were seen. When the archaeological excavation began in earnest in 1992, the nature of the surviving hull remains became apparent: there was indeed intact hull, primarily a combination of planking and framing fragments; some fairly-well preserved and some badly degraded. This same trend, with little deviation, continued to be revealed throughout the duration of the field study.

That the flat, wide, wooden pieces buried under stone ballast, laid side-to-side and end-to-end, and pierced with iron spike holes and treenails were carvel-style hull planks was easily recognizable. Because the continuity of the structure was interrupted in places by the activities of previous salvagers, there was never a plank of full-length seen on the site, but many of the pieces were sufficiently preserved to provide accurate widths, and sometimes thicknesses. Fortunately, the majority of surviving planking did remain in its original context, and parallel lines and the “runs” could be discerned. At the mid-ships point of the wreckage, where the planking survived to its widest extent, 21 possible strakes spanning 7.4 meters were found (Fig.3.3).

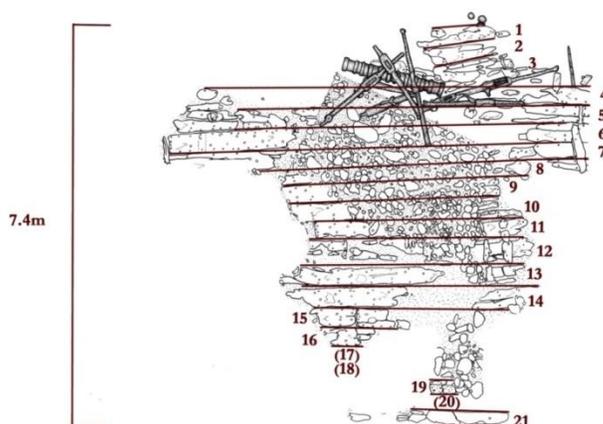


Figure 3.3. The strakes of exterior hull planking as found at the widest point of the ship’s remains.

The planks ranged in width from 25 to 36.5 centimetres. In general, the widest planks were found near the amidships point of the hull, while there is a narrowing of plank-widths toward the extremes, a reflection of the fact that the same number of strakes had to fit into a narrower space at the ship's ends (Fig. 3.4).



Figure 3.4. Selected planking widths across the St. Johns hull structure

| | | | | | |
|------------|------------|------------|------------|------------|------------|
| A - 26.5cm | D - 26.0cm | G - 31.0cm | J - 36.5cm | M - 33.5cm | P - 28.5cm |
| B - 26.5cm | E - 27.0cm | H - 34.0cm | K - 32.5cm | N - 29.5cm | Q - 29.0cm |
| C - 25.0cm | F - 31.0cm | I - 33.0cm | L - 34.0cm | O - 31.0cm | R - 29.5cm |

In general, the thickness of the *in situ* planking was not recorded, as these pieces were not lifted or removed from where they lay, which precluded the collection of this measure. Many thicknesses were recorded, though, from the displaced, loose planking fragments that were encountered and documented during the course of the project. From all the thickness measures collected, the pieces identified as hull planking generally ranged between 52 to 61 millimetres, with 58-59 millimetres being most common (Fig. 3.5). A few outliers were found, ranging from 47 to 74 millimetres.

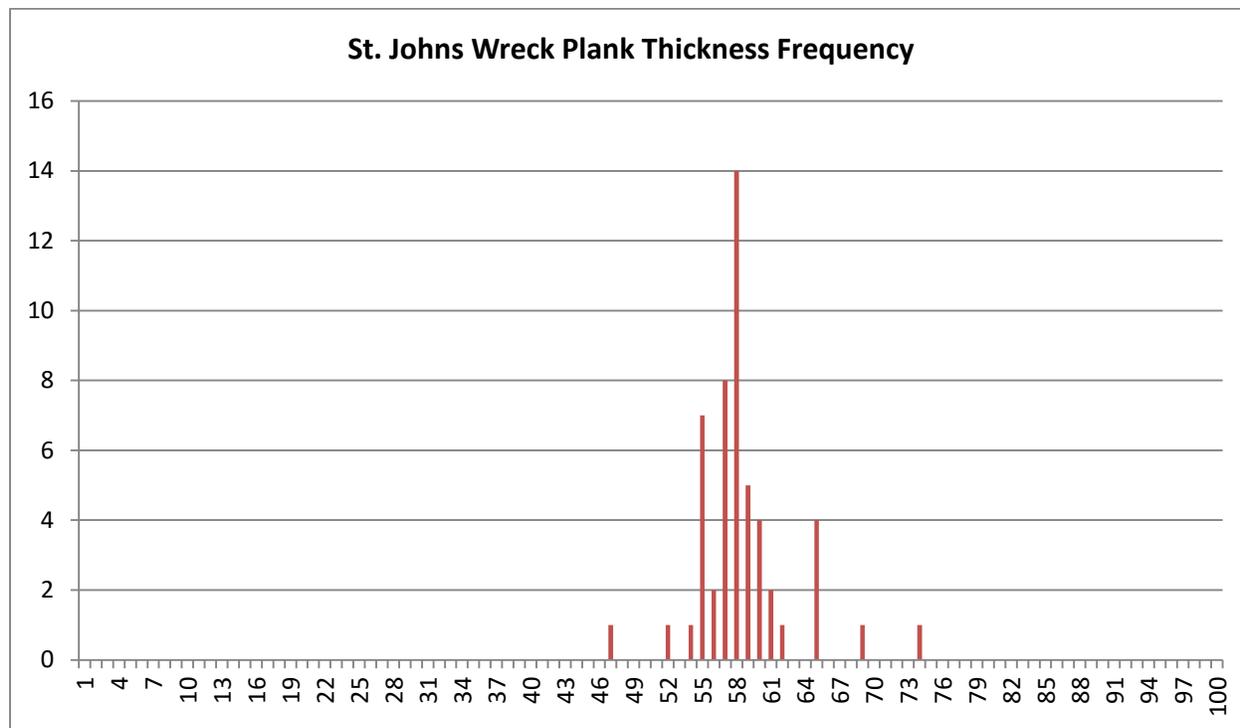


Figure 3.5. Planking Thicknesses in millimetres (bottom) by numbers of St. Johns Wreck Planking Fragments.

Framing Timbers

Elements of the ship's framing were found on the site, too, represented by narrower and sometimes thicker pieces running perpendicular to the interior surfaces of the planking. The frames tended to be much more badly fragmented and degraded than the planking; perhaps an indication of greater exposure to the elements. Despite their relatively poor preservation, evidence could be gleaned from the remains for insight into the nature and dimensions of these structural components.

The sided measure (width) of the framing components was best gauged from two small sections found in their original position and still attached to the inside faces of planking. One piece, believed to be the top end of a floor timber, because it was found attached to and extending below the lowest strake in

the north-westernmost area excavated in 1999, was 22 centimetres wide. The bottom-end of a futtock just forward of it was sided at 21 centimetres. The “room & space” – the measure of the distance from centre-point to centre-point of two frames – was 43 centimetres at the bottom of the first futtocks in this same area. Another complete sided dimension of a frame piece was found in one of the easternmost areas of the wreck in 1993, and it measured 20.3 centimetres. Unfortunately, abrasion had eroded all of the framing components so that no accurate moulded measures (depths or thicknesses) could be gauged.



Figure 3.6. Detail of hull planking and framing timbers thought to be at the overlap of the 1st and 2nd futtocks in an area just aft of amidships, 1993 (Photo: Dylan Kibler/MFMHS).

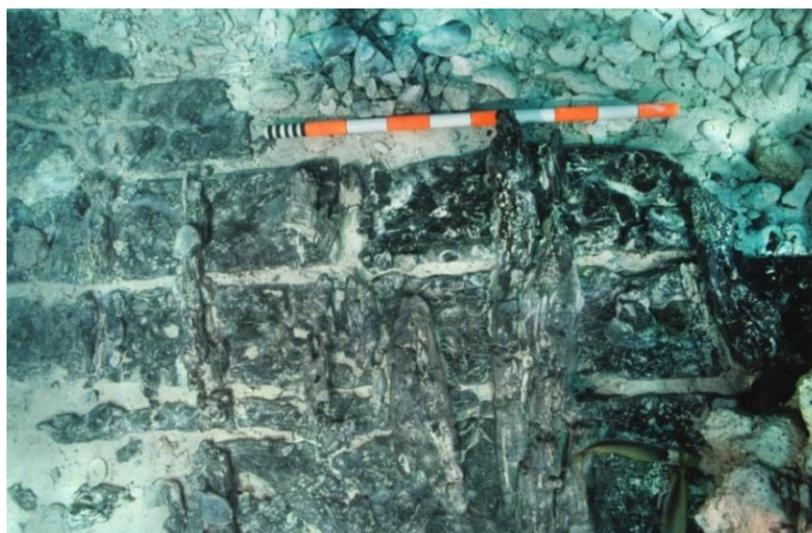


Figure 3.7. Detail of hull planking and framing timbers at overlap of floor and 1st futtocks near the lower bow of the ship, 1999. (Photo: Dylan Kibler/MFMHS).

The planks and frames were joined together with combinations of square-shanked iron spikes and round, wooden treenails. With very few exceptions, the iron spikes did not survive undamaged in the wood and only the holes they had created, or countersinks for their heads, marked their presence. On the inside faces of the planks, because both pieces had been subjected to the same erosive forces, the treenails were usually found worn flush with the surface. The numbers of fasteners at every plank/frame intersection varied: Toward the bow and stern ends of the structure, two spikes and one treenail, or two spikes and two treenails were most common; toward the centre, two spikes and two treenails, three spikes and one treenail, or three spikes and two treenails are seen. At the butt ends of the planks, they were most frequently fastened with a combination of three iron spikes and two treenails, though there were instances where the treenails were not used. The iron spike shanks ranged from 1.5 to 1.8 centimetres wide and the treenails from 2.5 to 3.0 centimetres in diameter. The treenails were driven flush with the exterior surface of the plank, and they were “headed” with a strike of a chisel or other sharp instrument as a way of expanding the head, apparently to make it more difficult for the fastener to pull through.



Figure 3.8. Examples of St. Johns Wreck Fastener Patterns. (L) Exterior side showing three alternating iron spike holes, countersunk for the heads, and two treenails. (R) Interior faces of two butt-ends, each with three iron spike holes (Photos: David D. Moore/MFMHS).

Centreline Timbers

Two components from the wreck appear to be centreline timbers, meaning they are likely pieces of keel, keelson, or possibly the stem or the stern-heel. One was found in its original position, running parallel with the planking, and it was the westernmost part of the hull to be discovered. The piece was very poorly preserved but was obviously different than the planking. The piece was badly eroded and worm-eaten, and it had decayed into six pieces that spanned 3 meters (Fig.3.9). It was 23.5 centimetres at its

widest and 7.7 centimetres thick at the thickest. It had no evidence of fasteners except for a single, round hole that was apparently intended for a bolt. Because it was the westernmost piece of structure, in the scheme of the wreckage, it would mean that it was the piece closest to the bottom of the ship. This bottom-most location, coupled with the signature of few fasteners and relatively widely-spaced holes for bolts is what would be expected of the keel or keelson (Loewen, 2007: 36). Though a keel or keelson would be expected to have much stouter dimensions, the relatively flat, almost plank-like cross-section might simply be the result of severe deterioration.

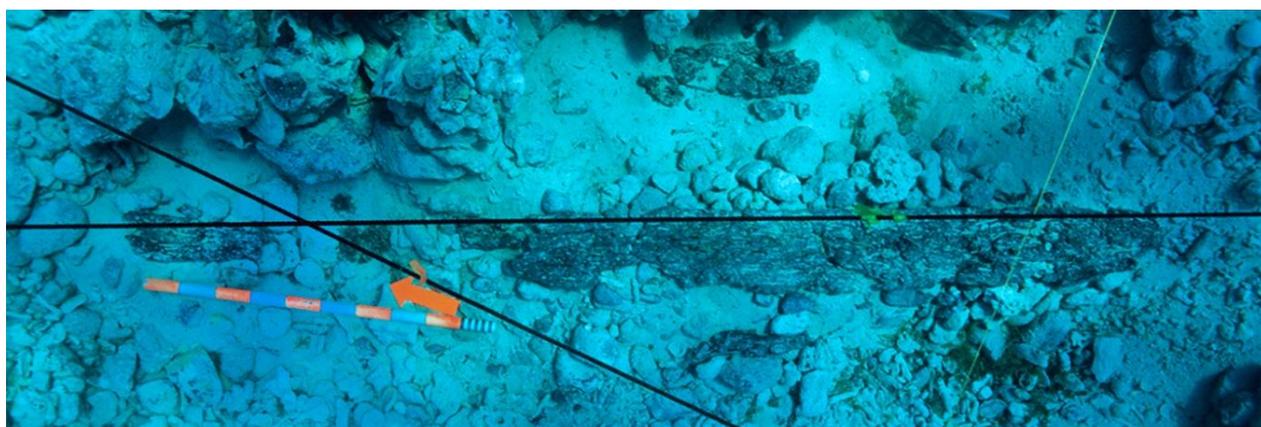


Figure 3.9. Westernmost hull component; possibly a section of keel or keelson with N-S baseline and another line showing the orientation of the hull remains, 1995. (Photo: Dylan Kibler/MFMHS).

A much more sizable piece of hull structure found on the St. Johns wreck is a piece of what is certainly a centreline timber. This wooden component is roughly square in cross-section, scarphed, and rabbeted to fit it together neatly with other timbers (Figs. 3.10 & 3.11). This piece was found at the northern end of the site, near the bow of the vessel, but, unfortunately, it had been removed by a previous salvage expedition and was not in its original position. Exactly where it came from on the wreck has not been determined.

The piece is much more substantial than any other pieces from the wreck at 1.86 meters long, with maximum dimensions of 27 centimetres, sided, and 27 centimetres, moulded. One end is worm-eaten, rendering it incomplete and leaving its full length unknown. Also, the surface is abraded in many places, and the scarph is split. The piece has no discernible curvature.



Figure 3.10. A photo of face C of the 2nd St. Johns wreck centreline timber. (Photo: Jeff Keiser/MFMHS).

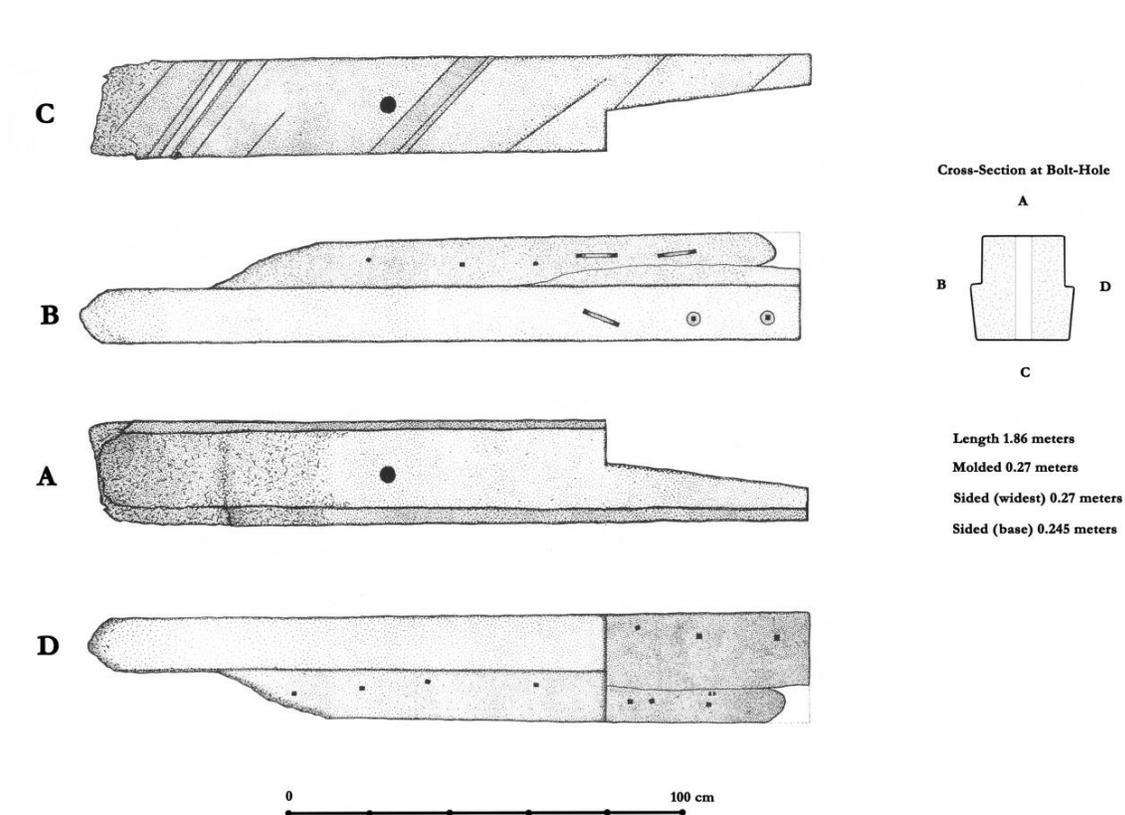


Figure 3.11. Drawing of the four faces of the St. Johns centreline timber, and cross-section at the bolt hole.

The scarp is 54 centimetres long and angles from 6 to 7 centimetres at its narrower, far-end, to 10 to 11 centimetres where it meets the main body of the timber. The scarp bears evidence of a combination of two types of iron fastener – spikes and U-shaped staples – that once joined it with a counterpart

timber. The iron staples are unique to this piece; seen nowhere else on the site. Rabbets that parallel each other down opposite sides of the timber's length, apparently to receive plank ends or the edges of garboard strakes, and they vary in the sided dimension from 2.5 to 4.2 centimetres, and in the moulded from 12.5 to 14 centimetres. Holes from iron spikes with 1.5-centimetre-wide shanks, spaced at an average of 20 centimetres, pierced the faces of both rabbets. The U-staples were driven through the rabbeted face, flush with its surface, as a way of joining the scarphed arm to another, before any of the planking was attached. A large, four centimetre diameter round-hole is drilled vertically through the centreline of the timber, apparently designed to receive an iron bolt that was no longer present. One face of the piece bears multiple, angled saw-marks from when it was cut to size. No other tool-marks were seen to indicate how the other faces were shaped.

Similarly-fashioned wooden hull components have been seen on other Spanish-colonial era shipwrecks, and they are all identified as centreline timbers, relating to the keel, bow-stem or sternpost. Two shipwrecks from an attempted 1559 settlement effort at Pensacola Florida both have similar structural elements. One, the Emanuel Point I site, had two pieces of the bow-stem and the forward end of the keel that were similarly-scarphed (Smith, Bratten, Cozzi, & Plaskett, 1998: 31-38). The stem pieces were rabbeted in the same fashion as the St. Johns piece. The uppermost section of bow-stem was 30 centimetres (sided) by 31 centimetres (moulded), the lower section that scarphed to the keel was 28 centimetres by 28 centimetres, and the keel was 31 centimetres (sided) by 29 centimetres (moulded) (ibid: 61). At the Emanuel Point II site, the forward section of the keel had a similar scarph to fasten it with the bow-stem, and it was rabbeted at its upper face. It measured 30 centimetres (sided) by 27 centimetres (moulded) (Cook, 2009: 94).

The well-preserved, submerged remains of a 1565 Basque whaling galleon found at Red Bay, Newfoundland had a number of similarly-designed hull components: the keel was similarly-scarphed at both ends for attachment to the bow-stem (47 cm) and the heel (54 cm); the moulded dimension was 26-27 centimetres at these ends, and the sided was 21-22 centimetres (Lowen, 2007a: 31). The two counterpart timbers of bow-stem and stern-heel were of mirroring design where they joined the keel and were similarly-proportioned (ibid: 28; 41). The keel was vertically-pierced by long iron bolts at intermittent intervals ranging between 1.3 to 2.0 meters. The bolts continued from the keel through the floor-frames and keelson and joined these key elements to form the ships "spine" (ibid: 37).

A five-meter portion of the keel and sternpost from the shipwreck thought to be the Spanish nao *San Esteban* of 1554, was found off the coast of Padre Island, Texas, and it had a scarph much like that seen

on the St. Johns piece placed on the sternpost, where it met the deadwood and keel, but no scarp was on the keel itself. The portion of the keel that survived was 27 centimetres, moulded, for much of its length; its maximum sided dimension was 31 centimetres (Rosloff and Arnold, 1984). The *San Esteban's* keel was also affixed to other large counterpart timbers by iron bolts placed vertically along its centreline.

The preponderance of similarly-designed pieces identified as centreline timbers strongly suggests that the St. Johns piece is in the same class. More specifically, the rabbeting, and the relatively sparse 18 to 25 centimetre spacing of fasteners along the rabbeted faces, are more in line with the attachment of the lower edge of a garboard than they would be for the ends of a series of strakes, which would make it more likely that the piece is a portion of the keel rather than bow stem or sternpost.

Possible Knee

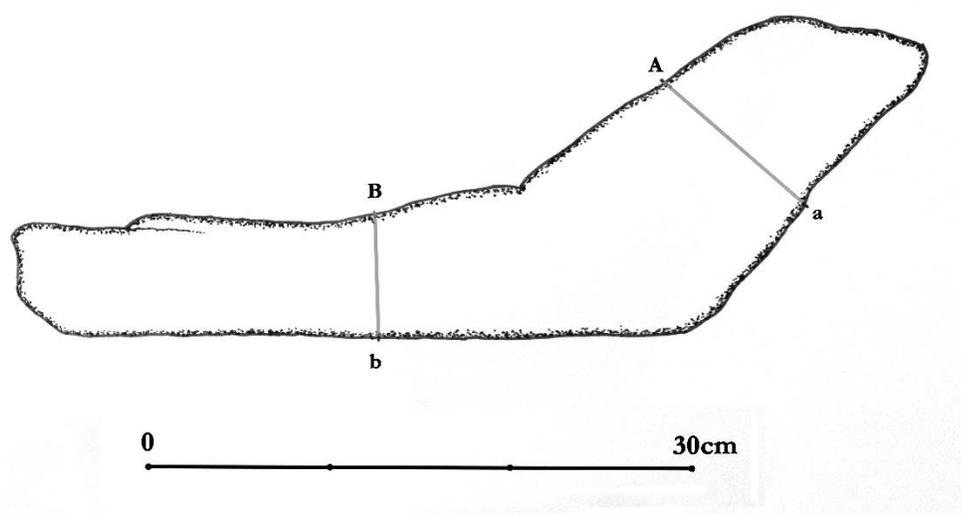


Figure 3.12. Drawing of exposed face of possible wooden knee.

One wooden piece found at the south-eastern edge of the hull structure was unusual in that it was shaped almost, but not quite, like a knee (Fig. 3.12). It was roughly V-shaped and had two arms, one 37.8 centimetres long and another 20.9 centimetres long, and finished, flat surfaces (though the lower, buried face was degraded); the inside of the crook showed a cut-like tool mark. One arm was 9.5x10.8 centimetres in cross-section (Aa), and the other was 7.1x11.4 centimetres (Bb). Oddly, there were no fasteners to be seen anywhere on this piece. Its function remains a mystery.

Lead Patches, Tool Marks, and Pitch

Additional features relating to the hull and its construction were revealed, and these include tool marks, lead sheeting, and coatings of pitch or resin.

As noted above, a large centreline timber showed shallow, angling grooves along one surface that appeared to be saw marks from when the piece was cut to size, and a “knee” bore a cut mark. But, because of the high incidence of abrasion on the surfaces of the wooden hull components, such marks were rarely found elsewhere on the St. Johns wreck. Only one other piece showed any significant tool marks. This was the interior face of the end of a piece of exterior hull planking that bore a half-dozen shallow, more-or-less perpendicular grooves running across the width of a worn end (Fig. 3.13). These score marks look to have been done with a saw, perhaps a remnant of when the piece was cut to length or an attempt to score it facilitate its bending to a curve.



Figure 3.13. Score marks across width of interior face of hull plank. (Photo: Dylan Kibler/MFMHS).

Another interesting feature found in at least two places across the shipwreck site is the use of pitch or resin to coat the inside face of planking (Fig. 3.14). The surfaces where it was seen had once been the intersections of the planks and now-missing frames. Considering this, the pitch might have been a way of sealing of the plank/frame interface, keeping water out, and stymying moisture-induced rot. Or, if it was used to coat the interior of the hull more broadly, it could have served as a way of holding back seepage from the outside.



Figure 3.14. An area of pitch or resin coating the interior face of a hull plank. (Photo: Dylan Kibler/MFMHS).

The St. Johns wreck also showed *in situ* evidence of patching in at least two places, where pieces of sheet-lead covered sections of the hull's exterior. These patches were small and localized; there was not enough sheet to suggest that the hull was fully-sheathed in lead as an anti-fouling or shipworm barrier. The lead patches look to have been a way to keep water out of plank seams or as part of the maintenance and repair of the ship. The patches were placed at plank seams, where they laid flat against exterior of the hull. The lead looks to have been laid in wide strips (one measures at least 20 x 60 centimetres), though they were corroded and degraded and partially obscured by the planking, so their full dimensions are not known. Small holes from square-shanked tacks spaced every 3 to 4 centimetres pierced the edge of one piece. In addition to these pieces, many smaller fragments of lead sheet were found scattered throughout the site, suggesting there were other such patches that had degraded over time.



Figure 3.15. Lead patches as found on the St. Johns site. (Photos: Dylan Kibler/MFMHS).

There was evidence that seams between various hull components on the 1554 fleet shipwrecks were covered by narrow strips of lead and resin-impregnated cloth, which were fastened to the hull with small, broad-headed iron tacks, whose shanks were driven into the plank seams instead of the wood (Arnold and Weddle, 1978: 223, 236, 263). Similar strips of lead with regularly spaced rows of tack holes were found on the Emanuel Point I shipwreck – where there were many examples covering planking seams, while other pieces of lead sheet covered the ends of rudder gudgeons (Smith, Spirek, Bratten, and Scott-Ireton, 1995: 60-62).

Iron Fasteners

Aside from the aforementioned wooden dowel trenails and fastener holes documented in the hull remains, a wide variety of iron fasteners, pulled free from the structure or left behind after the wood decomposed, have also been recovered from the St. Johns wreck. There are around 1500 iron fasteners of various size and design. The vast majority are spikes, nails, and tacks. The others are bolts. The collection of iron fasteners is largely unconserved, and much work laboratory work is needed to properly study them as a group. Enough pieces have been cleaned, though, to develop a beginning typology of fasteners from the wreck. So far, nineteen types have been identified.

The spikes, nails, and tacks are distinguished by having been driven into the wood by force. They have sharp points, square-sectioned shanks (usually), and heads to receive the driving blows and to stop them. These fasteners range in length from 25.7 centimetres to 2.4 centimetres (Fig. 3.16; table 3.1). These pieces are differentiated largely by size (i.e. spikes are larger than nails), but other morphological features are also factored into the classifications. The spikes also are distinguished by their thicker, irregularly-shaped, domed heads and the nails by their thinner, flat heads. Though the tacks have shanks that are similarly sized to some nails, their much-broader heads set them apart.

All of the bolts are forelock bolts - dull-pointed, large fasteners that were set into pre-drilled holes and held in place with iron rings placed over the point-ends and secured by iron wedges that were driven into slots at the end of the bolt. This system was the same as employed in securing the shroud-chains to the hull. Most have round, domed heads, but two examples have rings. One example is square in cross-section and has a square head.

García de Palacio described the numbers and types of fasteners that should be carried in the stores of an Indies ship, and though specific sizes are not mentioned, his list offers some correlation to the St. Johns collection. His suggested inventory: “Four thousand sheathing tacks, two thousand framing-nails,

two thousand bottom-nails and medium bottom-nails, one thousand side-nails and medium side-nails, 500 tipped (pointed) bolts, 20 forelock bolts, 50 rings, 50 forelock wedges” (García, 1587 [1993]:307). Barkham has examined construction contracts and other historical documents for Basque whaling ships of the mid to late 1500’s and found twelve different types of iron fastener were distinguished in these documents – round bolts ranging between 46.5 and 28.6 centimetres, and square spikes between 44 and 12 centimetres (Barkham, 2007:14-15). This same research showed that a ship of 200 tons would have required between 6,000 and 7,500 pounds of iron fasteners in its construction. Lyon found that a chief difference between Spanish shipbuilder’s spikes and joiner’s nails were the heads: those for ships had heavy domed heads, while those used by joiners had flatter heads (Lyon, 1988:326). This might be a reason for differences in some of the St. Johns types.

| Artifact # | Type | L.O.A. | Shank Diameter | Head Diameter | Comments |
|------------|-------------|-------------|----------------|----------------|--------------------------|
| 92-1159 | Bolt | 98.0 | 2.3 | 6.35 | Slot 2.9 x 1.0 |
| 99-2720a | Bolt | 52.0 | 3.0 | 7.1 | Slot 2.1 x 0.9 |
| 92-0972 | Bolt | 35.2 | 2.8 | 6.4 | Slot 2.8 x 0.9 |
| 92-0895c | Bolt | 25.7 | 2.7 | 5.9 | Slot 2.0 x 0.6 |
| 97-2380 | Square Bolt | 36.5 | 2.8 | 5.7 | Slot 2.3 x 0.5 |
| 97-2506 | Ring-Bolt | 38.1 (inc.) | 2.9 | 6.2 OD; 3.0 ID | Original length ca. 41.0 |
| 96-2125 | Ring-Bolt | 29.2 (inc.) | 2.9 | 8.0 OD; 3.1 ID | |
| 97-2417b | Spike | 27.2 | 1.5 | 3.9 | Round shank; Square-tip |
| 92-1227a | Spike | 25.7 (inc.) | 1.6 | 4.4 | |
| 93-1415j | Spike | 25.7 | 1.5 | 4.0 | Chisel-tip |
| 95-1729 | Spike | 22.5 | 1.3 | 3.3 | Square-tip |
| 97-2276 | Spike | 19.0 | 1.4 | 3.2 | Square-tip |
| 96-2040d | Spike | 17.3 | 1.1 | 2.7 | Square-tip |
| 96-2129d | Spike | 13.0 | 0.8 | 2.0 | Chisel-tip |
| 93-1402 | Nail | 10.4 | 0.6 | 2.0 | Flat head; Square-tip |
| 92-0817 | Nail | 8.4 | 0.5 | 2.0 | Flat head; Square-tip |
| 97-2565p | Nail | 3.4 | 0.3 | 1.0 | Flat head; Square-tip |
| 97-2472 | Tack | 5.0 | 0.3 | 1.6 | Flat head; Square-tip |
| 95-1845 | Tack | 2.4 | 0.3 | 2.0 | Flat head; Square-tip |

Table 3.1. Measurements of iron fastener types found on the St. Johns Wreck.



Figure 3.16. Typology of Spikes, Nails, and Tacks from the St. Johns Shipwreck.

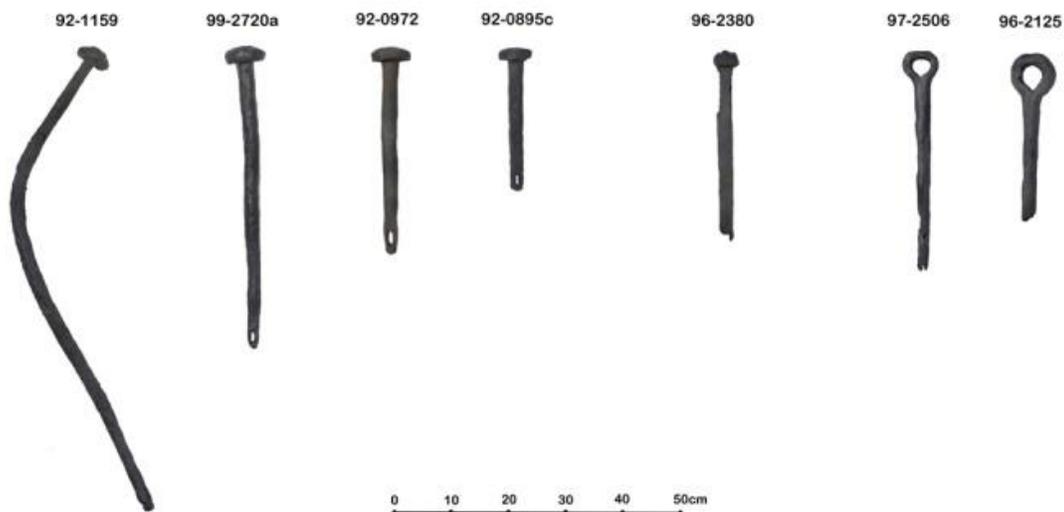


Figure 3.17. Typology of Bolts from the St. Johns Shipwreck.

As has been discussed earlier, iron spikes and wooden treenails were used to attach the ship's planking to the frames, and the same is true for virtually all other known Spanish Indies shipwrecks of the sixteenth century. Evidence from still-intact examples shows that the longer bolts were used to join thicker structural elements such as the keel, floors, keelson, and knees on the *San Esteban* of 1554, the 24M vessels at Red Bay and the Highborne Cay Wreck (Rosloff & Arnold, 1984; Light, 2007:174-175;

Peterson, 1974:238). Though most of the St. Johns bolts were found loose and out of their structural context, two were found in what appears to be a chain-wale, and the keel fragment had a large, round hole to receive such a fastener. The other, specialized bolts – the square-shanked piece and the eye-bolts – had unknown functions.

The spikes and nails were used to hold less substantial components together. Lyon's observation about the thickness of nail heads might be applicable to this collection: Those with the larger, domed heads are of the size to have held the ship's structure together, while the smaller, flat-headed nails seem more appropriate for lighter work such as doors or furniture. The purpose of the unusual, round-shanked spike is not known, but parallel examples have been seen on the Red Bay 24M ship; their purpose there is also unclear (Light, 2007:176-177). Other pieces, like a fused mass of small nails, look to have been stored in a container on the ship (see Fig.16.9).

The collection of fasteners from the St. Johns Wreck is consistent with those from a substantially-sized vessel, and they are types that are known from other, similar shipwrecks. There is much more work to do, and much more to learn about these pieces, as the majority of spikes and nails, especially, remain to be conserved. There will almost certainly be other types revealed as the work continues.

Rigging



Figure 3.18. Shroud chains, *in situ* at the time of their discovery. (Photo: Dylan Kibler/MFMHS).

A set of eight iron chains were found lined in a row along the eastern edge of the St. Johns wreck, and an analysis of their form shows they are shroud chains, part of the ship's fixed, standing rigging. The bottoms of these chains were originally bolted into the side of the hull, and their top ends held deadeyes that provided the attachment points for the shroud lines that ran to the top of the mainmast.

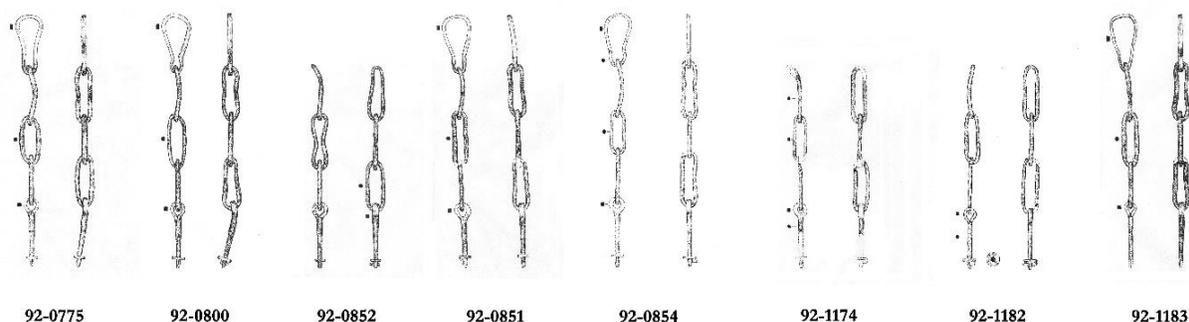


Figure 3.19. Drawings of the St. Johns shroud chains in the order found, from South (L) to North (R). (Drawing: Robert Cummings/MFMHS).

The eight chains are all made of wrought iron and consist of a ringed forelock-bolt designed to pass through and attach to the hull; three oblong links and one strop for a wooden heart or deadeye trailing upward from the bolt. Five of the examples are complete, and three are missing the deadeye strops (Fig. 3.19). The full sets of chains were similarly sized, with an overall length of ca. 133 centimetres; bolts of 34-35 centimetres; chain links of 26 to 28 centimetres long; deadeye strops of 31 to 32 centimetres long by 15 to 16 centimetres wide. The links were made of round-stock of 2.5 to 3.0 centimetres diameter; the deadeye strops were round where they connected with the iron links but flattened to a rectangle of 1.5 x 2.0 centimetres where they would have wrapped around and held the wooden heart or deadeye (Fig. 3.21). In all the sets, the third loop was pinched and bent. The bend was apparently to accommodate a thicker wale timber that held the chains out and away from the ship's hull, so they would not rub and chafe against it, while also increasing lateral tension to the mast-top.

Shroud chain assemblies were described by García de Palacio in his ship's treatise as such: "... they [the chain wales] have coming under them twelve chains [six per side] of four or five links; of a palm [in length] for each link, somewhat elongated, according to the thickness of the said chain wales, with their dead-eyes, from which they hold and secure twelve shrouds, which are some sixty-strand ropes, for both sides... They stiffen and strengthen the mast, so that it does not move in any way" (García de Palacio, 1587: 283). Palacio notes that the foremast was to be rigged the same as the mainmast, except with eight shrouds (ibid: 285).

The shroud chains were found in association with a wooden piece that was possibly a fragment of a chain wale. This heavily-abraded, wooden piece was certainly heavier than the planking at 13 centimetres thick, and it was pierced by a series of iron bolts and spikes (Fig. 3.20).

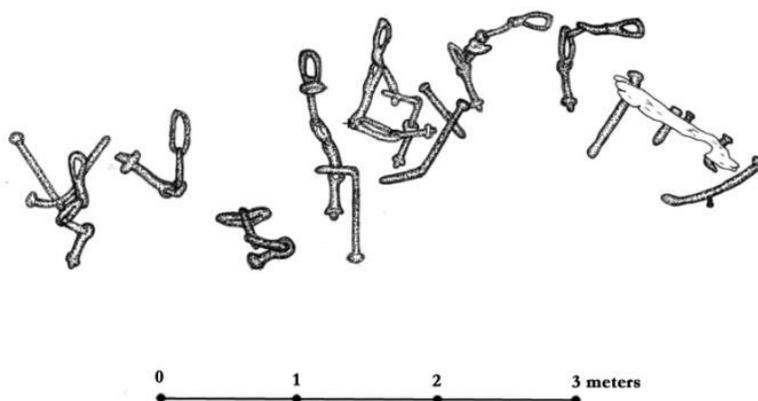


Figure 3.20. Drawing of the St. Johns wreck shroud chains as found on the site, along with a possible chain wale fragment. (Drawing David. D. Moore/MFMHS).

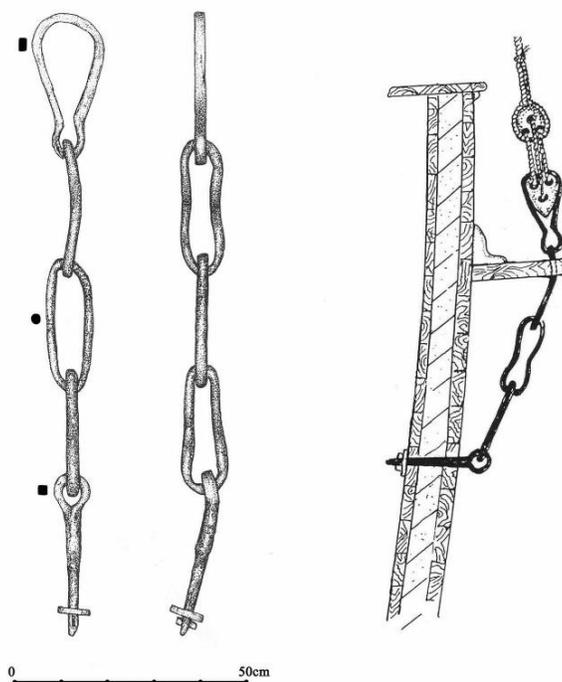


Figure 3.21. Two views of a St. Johns shroud chain, and a hypothetical reconstruction of how it mounted on the ship. (Drawings Robert Cummings/MFMHS).

Shroud chains are almost always associated with a square-rigged vessel. Lateen rigged sails are mounted fore-and-aft between the shrouds – the lines that run from the masthead to the ship's hull to help support the mast – and the lateen sail is thus easily obstructed on the leeward side by these lines. Lateen sails then require shrouds that can be readily eased, a need that is best served by pendants tensioned by tackle rigged inboard for easy access (Nance, 1992). Square-rigged sails mount perpendicular to the length of the ship and are set before the shrouds. This means the sail may be set on either tack without being obstructed by the shrouds. This, then, allows for the shrouds to be placed in a fixed position, and this was most commonly done with the ends of the shrouds running down from the masthead and linking, via hearts or deadeyes, to counterpart deadeyes set in the uppermost loops of chains permanently-fixed in the upper exterior of the hull.

The square rig was adapted by southern European and Mediterranean mariners from northern European ships in the fifteenth century for use on their larger, open-ocean vessels, and was the preferred rig for those traversing the Atlantic in the age of exploration (Nance, 1955: 185). The shift from lateen to square sails may have generally been a distinguishing feature between caravels and larger *naos*, but even *naos* often utilized a lateen rig on the aft-most mizzen masts (Edwards, 1992: 427). But open-ocean caravels sometimes used the square rig, as is seen when the famed caravel *Niña* (aka *Santa Clara*), used by Christopher Columbus in his 1492 transatlantic voyage, was, in 1498, rigged for square sails with six shrouds on each side for the mainmast, four on each side of the foremast, and three each side of the mizzenmast (Lyon, 1993; Lakey, 1993:243).

The archaeological record makes clear that shroud chains of comparable-size and design to those of the St. Johns wreck were commonly used on other early Indies ships. There were sets of three chains clustered in three groups at the sixteenth-century Highborn Cay wreck. (Peterson, 1974; Smith, Keith, & Lakey, 1985). One wooden heart, pierced in the centre with a single triangular hole, was preserved within one of the Highborn Cay chains, as well. At the Molasses Reef site, two sizes of iron deadeye strop, one 33 centimetres long and the other 37 centimetres, attached to elongated iron links were found (Keith, 1987: 116-118). Another five shroud chains were recovered from the 1554 fleet shipwrecks, and these, too consisted of a deadeye strop, three elongated links, and a forelock bolt to fit into the hull (Arnold & Weddle, 1978: 234-235; 301). Many wooden heart blocks pierced by single triangular holes, were recovered from the Red Bay shipwreck, believed to be the Basque whaling galleon *San Juan* of 1565, with 22 of them grooved to fit into iron strops, though only one iron chain link was found in association to them (Bradley, 2007: 3-5). The link, made of 2.0 to 2.5 centimetre diameter bar-

stock, 33 centimetres long and 9 centimetres wide, was sized similarly to the St. Johns examples. Shroud ends were also found on the Red Bay site, and they carried wooden heart blocks that were fixed by rope strops; these hearts would have then been further lashed with ropes to lower, chained counterparts (ibid.).

Based on the location of the St. Johns chains near the middle of the shipwreck, and their position relative to the stored artillery (as elaborated upon in the discussion of the ship's guns), these chains certainly represent those that once attached to the shrouds of the mainmast. There have been no chains found either forward or aft of this set that would be associated with the fore or mizzenmast.



Figure 3.22. An illustration of a sixteenth-century sailing ship shows how the chains connected to the hull and shrouds and served to tie the top of the mast to the hull. (Hans Holbein der Jüngere, "Ship with Revelling Sailors," ca. 1532-1533, Städel Museum, Frankfurt).

Coaks

Though no wooden blocks or pulleys have been found in the wreckage, there is direct evidence for their use on the ship. Three pieces are identified as coaks, the metal bushings that mounted in the centre of a block's wheel-like sheave to keep the sheave pin from wearing or splitting it. John Smith wrote an early description: "Blocks or Pullies are thick peeces of wood having shivers in them, which is a little Wheele fixed in the middest with a Cocke [coak] or Pin..." (1627:19). Henry Manwayring defined "Cocks" as "Little square things of brasse with a hole in them, put into the middle of some of the greatest wooden sheaves, to keep them from splitting and galling by the pin of the block on where they turn" (1644:27).



Figure 3.23. Coaks 97-2459 (R) 93-1459 (C) and 97-2536f (L).

One of the St. Johns coaks, 97-2536f, is, as described by Manwayring, a "little square thing," but made of iron instead of brass. It is 2.6 centimetres deep, which would be the width of the sheave that held it, and has a round hole 2.2 centimetres in diameter, an indicator of the size of the pin. The body is 3.2 centimetres by 3.3 centimetres across. Two other pieces are made of brass or bronze, and though they are not square, they are thought to be another form of coak. These pieces have slightly-tapering, cone-shaped bodies, with angular "ears" protruding from two opposing sides to prevent slippage and spinning. Holes of consistent diameter run through their centres for the pins. Coak 93-1459 is 3.0 centimetres wide, with a hole of 1.9 centimetres diameter; it is 3.5 centimetres wide at one end and 3.15 at the other. Coak 97-2459 is 2.6 centimetres deep, with a hole of 2.0 centimetres diameter. One side is 3.0 centimetres diameter; the other is 2.7 centimetres. It is corroded, so many of the measurements are likely off from the original.

Coaks are known from other Spanish shipwrecks of the sixteenth century. The Molasses Reef Wreck had two square coaks, designed much like St. Johns 97-2536f, with one made of iron and the other of bronze (Keith, 1987:119). Similar, square bronze coaks were found on the 1554 shipwrecks, but one example had protruding ears on opposing sides as spin-preventers (Arnold and Weddle, 1978:238; Olds,

1976:45). At least nine examples of square, bronze coaks come from the 1588 Spanish armada wrecks *Girona* and *La Trinidad Valencera* (Flanagan, 1988:47-48). The presence of coaks on the St. Johns wreck makes clear that substantial blocks were being used as part of the rigging to adjust the spars and sails or to help haul heavy loads in and out of the ship.

Anchor

In 1992, a large, iron anchor was discovered sitting at 0.42 nautical miles north-northwest of the St. Johns site. It was sitting flat and exposed on the hard bottom in 12 feet of water (Fig.3.24). It was heavily encrusted with calcium carbonate concretion and marine life. It was 3.28 meters long from the crown to head and its arms were 76 centimetres long, with triangular palms of 42 by 30.5 centimetres. It had a ring of 40 centimetres diameter. The stock keys were set in a parallel plane with the arms. Though it is a bit distant from the shipwreck site, the anchor's measurements and features are all consistent with what would be expected of a ship of the St. Johns wreck's size and era. The anchor was measured, photographed, and left as it was found.

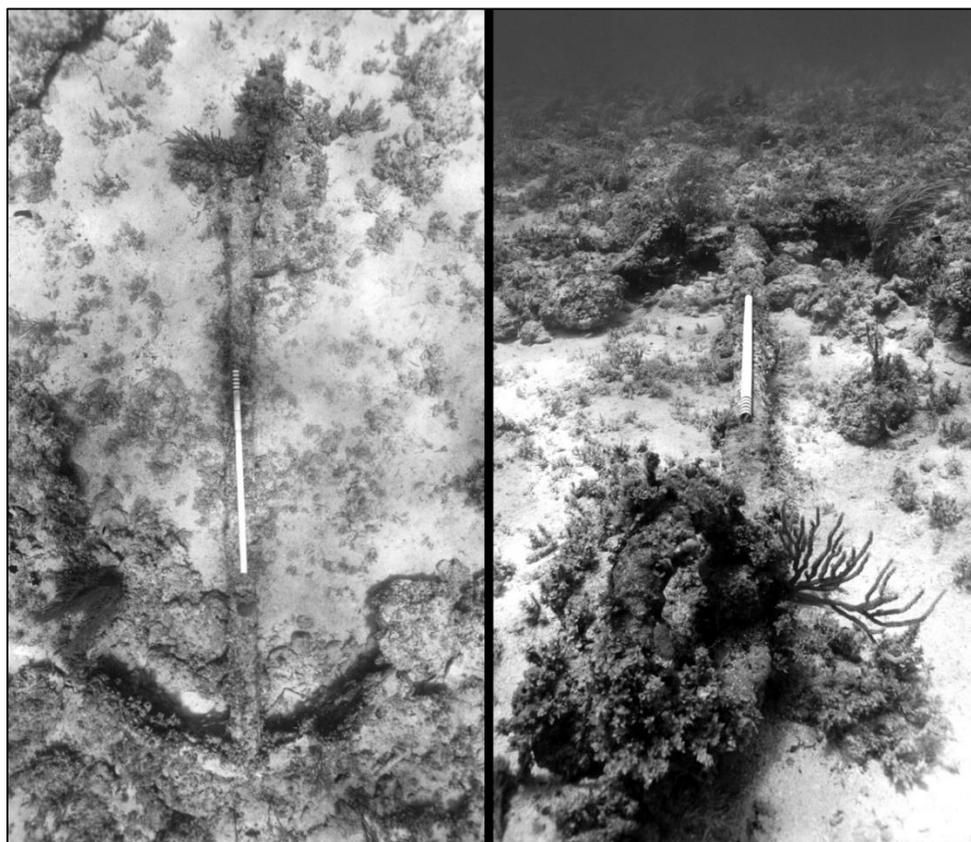


Figure 3.24. Anchor found near St. Johns shipwreck, two views. Scale = 1 meter. (Photos: Dylan Kibler/MFMHS).

An anchor of nearly identical size, design, and proportion was found on the ballast pile of the Molasses Reef shipwreck (Keith, 1987:162-163). Because it was apparently in storage, this anchor is described a sheet anchor, or one carried as a spare for emergency use. Other, smaller anchors of varying design thought to be boat anchors were also found around the Molasses Reef site, but their provenance is not clear. The *San Esteban* of 1554 had two anchors also of nearly the exact same size and dimensions as the St. Johns (Arnold & Weddle, 1978:304). These two anchors also appear to have been in storage at the time the ship wrecked. Another anchor from the site was slightly larger, at 4.15 meters long; another slightly smaller, at 3.30 meters (ibid: 298; 306). A similarly proportioned anchor from the Emanuel Point I shipwreck of 1559, was broken at a length of 3.14 meters and is missing its stock keys, ring, and crown (Smith, Spirek, Bratten, & Scott-Ireton, 1995:53). A very slightly smaller anchor of 3.0 meters was found at the Highborne Cay wreck (Peterson, 1974:234). The anchor found near the St. Johns site is certainly of the size and design typical of anchors known to have been carried on Spanish Indies ships of the early to mid sixteenth century, and it seems highly probable that it links to the shipwreck.

Stone Ballast

The most abundant material on the St. Johns site was stone ballast. This ballast was placed in the bottom of the ship's hold to make the vessel heavy and stabilize it in the water by acting as a counterweight against the force of waves and the wind in the sails. The amount of ballast required was dependent on the size of the ship's load and would change as cargo was added or removed. The St. Johns stones ranged from ca. 75 kilograms to a few grams, and they blanketed most of the wreck and were intermingled with the artefacts. Some areas of the ballast were fused by calcium carbonate concretion, as if they had once been exposed above the sea-bed and served as the foundation of a nascent reef. It is surely the protective effect of the ballast cover that allowed the wreck's hull to be preserved and for the artefacts to have maintained their relatively undisturbed positions over the centuries.

A significant aspect of the fieldwork was to measure the volume of the ballast that was removed during excavation, and this was done in two phases. First, as the excavation progressed from the surface of the seabed to the upper surface of the shipwreck, stone ballast that had been disturbed and displaced by earlier salvage efforts was encountered. These stones were collected as they were uncovered and carried to spoil piles designated for each 5m x 5m unit. When the excavation reached the intact, undisturbed wreckage, as each square-meter sub-unit was excavated, its ballast was also carried to a designated spoil pile for that unit. A ballast "volumizing" team would then record the volume for each of

the piles by packing the stones into baskets of known size and recording the number of baskets or portions thereof. Once the volumes had been recorded, the stones from each unit or sub-unit were placed together in a large, common pile to the south of the shipwreck site. All of the stone removed during the excavation of the St. Johns shipwreck totalled 30.93 cubic meters (see table3.2).

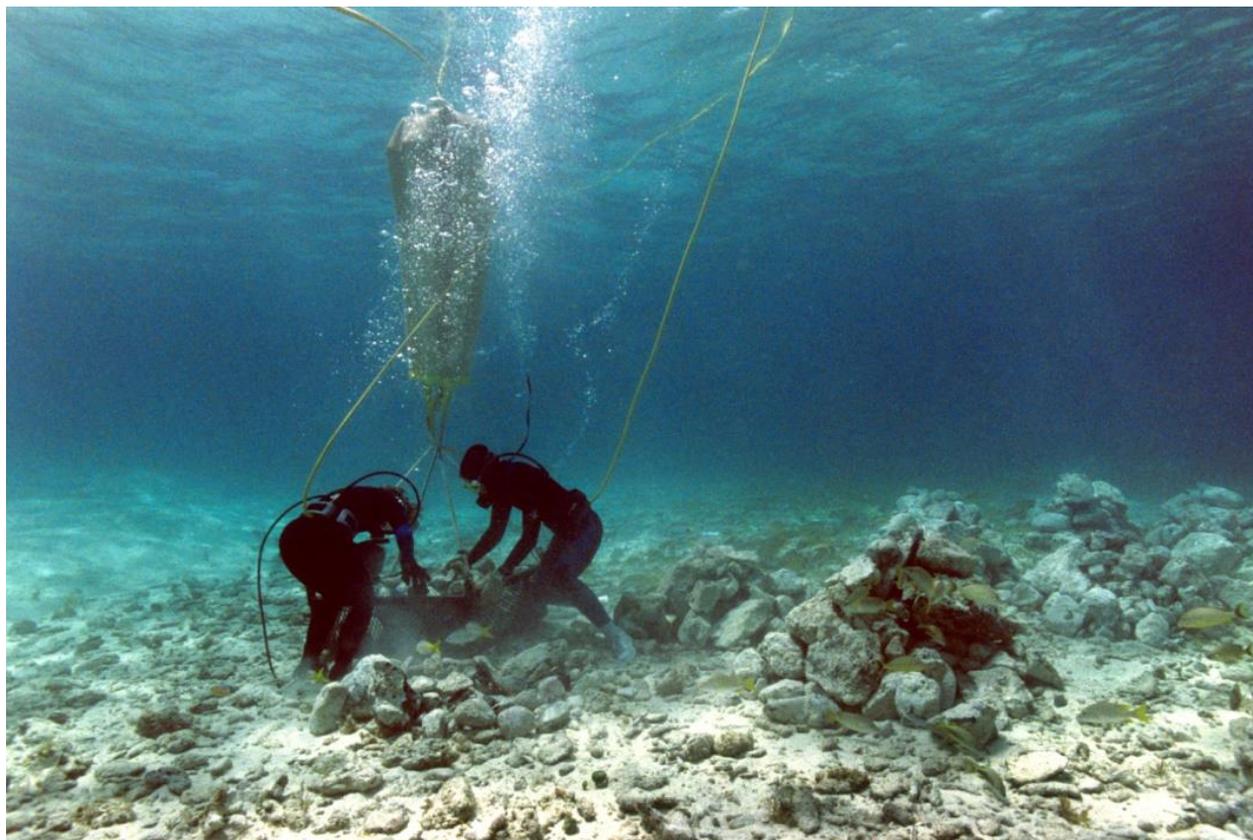


Figure 3.25. Divers recording the volume of ballast stones from excavated sub-units. (Photo: Dylan Kibler/MFMHS).

Units D5I and D3D were recovered and brought back to the laboratory for additional analysis. A total of 83 stones were in D5I, altogether weighing 267.5 kg and occupying 0.15 m³. The D3D sub-unit had 571 stones weighing 301.0 kg and occupying 0.17 m³. With these figures, one cubic meter would weigh 1767.14 kg (3895.88lbs) and 1779.59kg (3923.33lbs), respectively. Averaging the cubic-meter weights of the two units yields a figure of 1773.37 kg/m³. The total weight of ballast removed across the excavated areas of the St. Johns site is approximately 54,850.18 kg, or 54.85 metric tons (120,923.95lbs/ 60.46 tons).

**St. Johns Wreck
Ballast Volume Analysis**

| C4 | C5 | C6 | D3 | D4 | D5 | D6 | E3 | E4 | E5 | E6 | F3 | F4 | F5 | F6 | G3 | G4 | G5 | H4 | I4 |
|----------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| I/0.22 | A/0.20 | A/0.03 | D/0.17 | A/0.19 | A/0.11 | A/0.04 | T/0.19 | F/0.10 | B/0.10 | A/X | A/0.18 | A/0.27 | A/0.08 | F/0.11 | Q/0.26 | A/0.01 | A/0.02 | B/<0.01 | Q/<0.01 |
| J/0.15 | B/0.12 | B/0.03 | E/0.22 | | B/0.11 | B/0.04 | X/0.09 | G/0.11 | C/0.16 | F/X | B/0.16 | B/0.32 | B/0.04 | K/0.10 | R/0.25 | B/0.05 | B/0.01 | C/<0.01 | R/0 |
| N/0.11 | G/0.18 | | | | C/0.04 | C/0.03 | Y/0.16 | H/0.08 | D/0.10 | K/X | C/0.45 | C/0.24 | F/0.14 | P/0.08 | S/0.24 | C/0.01 | F/0.01 | D/<0.01 | S/0 |
| O/0.20 | L/0.10 | | | | D/0.11 | F/0.03 | | I/0.03 | E/0.11 | P/X | D/0.06 | D/0.34 | G/0.05 | U/0.10 | T/0.23 | D/0.02 | G/0.02 | E/<0.01 | T/<0.01 |
| | | | | | E/0.22 | G/0.04 | | K/0.11 | G/0.15 | U/X | E/0.13 | E/0.27 | H/0.31 | | U/0.18 | E/0.01 | K/0.02 | F/<0.01 | V/<0.01 |
| | | | | | H/0.20 | H/0.01 | | L/0.08 | H/0.15 | V/0.02 | H/0.03 | F/0.15 | I/0.36 | | V/0.26 | F/0.02 | L/0.01 | H/<0.01 | W/<0.01 |
| | | | | | I/0.15 | K/0.09 | | M/0.03 | I/0.08 | | I/0.04 | G/0.17 | J/0.22 | | W/0.28 | G/0.01 | P/0.05 | I/<0.01 | X/<0.01 |
| | | | | | J/0.06 | L/0.02 | | N/0.01 | J/0.07 | | J/0.20 | H/0.29 | K/0.29 | | X/0.11 | H/0.04 | Q/0.03 | J/<0.01 | Y/<0.01 |
| | | | | | M/0.22 | M/0.01 | | Q/0.01 | L/0.12 | | I/0.14 | L/0.20 | | | Y/0.20 | I/0.01 | U/0.04 | L/<0.01 | |
| | | | | | N/0.13 | P/0.03 | | R/0.05 | M/0.22 | | J/0.25 | M/0.09 | | | | J/0.02 | V/0.03 | M/<0.01 | |
| | | | | | O/0.06 | Q/0.38 | | S/0.34 | N/0.12 | | N/0.20 | N/0.39 | | | | K/0.03 | | N/<0.01 | |
| | | | | | R/0.22 | R/0.01 | | T/0.04 | O/0.07 | | O/0.14 | O/0.20 | | | | L/0.02 | | O/<0.01 | |
| | | | | | S/0.09 | U/0.04 | | U/0.28 | R/0.11 | | S/0.33 | P/0.22 | | | | M/0.02 | | P/<0.01 | |
| | | | | | T/0.07 | V/0.01 | | W/0.02 | S/0.15 | | T/0.22 | Q/0.22 | | | | N/0.05 | | Q/0.03 | |
| | | | | | U/0.06 | W/0.01 | | X/0.09 | T/0.17 | | X/0.19 | R/0.17 | | | | O/0.05 | | R/<0.01 | |
| | | | | | V/0.10 | | | Y/0.08 | W/0.11 | | Y/0.42 | S/0.18 | | | | P/0.14 | | S/<0.01 | |
| | | | | | W/0.11 | | | | X/0.22 | | | T/0.17 | | | | Q/0.22 | | T/<0.01 | |
| | | | | | X/0.07 | | | | Y/0.22 | | | U/0.29 | | | | R/0.10 | | U/0.01 | |
| | | | | | Y/0.03 | | | | | | | V/0.18 | | | | S/0.03 | | V/0.03 | |
| | | | | | | | | | | | | W/0.07 | | | | T/0.13 | | W/0.01 | |
| | | | | | | | | | | | | X/0.10 | | | | U/0.11 | | X/0.01 | |
| | | | | | | | | | | | | Y/0.13 | | | | V/0.22 | | Y/0.03 | |
| | | | | | | | | | | | | | | | | W/0.20 | | | |
| | | | | | | | | | | | | | | | | X/0.14 | | | |
| | | | | | | | | | | | | | | | | Y/0.63 | | | |
| 0.68 | 0.60 | 0.06 | 0.39 | 0.19 | 2.16 | 0.79 | 0.44 | 1.45 | 2.43 | 0.02 | 1.25 | 3.94 | 4.1 | 0.39 | 2.01 | 2.29 | 0.24 | 0.14 | 0.01 |
| Gen. | Gen. | | Gen. | | Gen. | | Gen. | Gen. | Gen. | Gen. | | Gen. | Gen. | | Gen. | Gen. | Gen. | | |
| 0.29 | 0.18 | | 0.16 | | 1.58 | | 0.68 | 1.36 | 2.26 | 0.28 | | 0.18 | 0.17 | | 0.03 | 0.15 | 0.03 | | |
| 0.97 | 0.78 | 0.06 | 0.55 | 0.19 | 3.74 | 0.79 | 1.12 | 2.81 | 4.69 | 0.30 | 1.25 | 4.12 | 4.27 | 0.39 | 2.04 | 2.44 | 0.27 | 0.14 | 0.01 |
| Total: 30.93 Cubic Meters | | | | | | | | | | | | | | | | | | | |

Table 3.2. The volume of ballast removed from each unit during the 1992-1999 excavations of the St. Johns wreck. All measures are in cubic meters.

The volume and weight of the ballast removed during the excavation represents only a portion of the stone carried by the St. Johns ship. Though the excavation appears to have cut through much of the site, there are also areas that have never been uncovered or examined, and they contain an unknown amount of ballast. Even without knowing the full, complete size of the St. Johns ballast pile, the known amount does still offer some insight into the size of the ship. In general, ballast on early Spanish Indies ships is not well-studied, but the few sites that have calculated amounts can be compared against the St. Johns figure. The Molasses Reef wreck had 25.75 m³ of ballast with a density of 1306.5 kilograms/m³, for a total weight of 36,255.4 kilograms for the entire pile (Keith, 1987:139). Lithological analysis showed the stone on the wreck came from Portuguese, Spanish, and English sources (Lamb, Keith, and Judy, 1990). The Highborne Cay site was initially estimated by Mendel Peterson to have a ballast mound of 50 tons (1974:241), but that figure was later revised upward to 70-75 metric tons (Keith, 1987:150). The Red Bay 24M vessel carried some 14.7 metric tons of ballast, but the stones were carefully arranged in union with the cargo of heavy oil casks – the stones were used not only to help make the vessel bottom-heavy, but they also served to shore and brace the casks and limit mechanical damage to the wooden vessels from the motion of a ship at sea (Ringer, 2007:199-202). The ballast pile of the 1554 *San Esteban* covered a maximum length of 15.5 meters, and appeared to be skewed forward, perhaps as a way to compensate for the weight of the ship's stern-castle (Doran and Doran, 1978:380).

The ballast on the St. Johns wreck covered a length of 25.3 meters, but its original extent was likely shorter, as the ship had rolled on its side sometime in the wrecking process and the structure later flattened, and the pile shifted and slumped. Considering, though, that the excavation cut through the heart of the site, what was removed surely represents a majority of the pile, and the total amount present on the site is unlikely to exceed 100 metric tons.

Discussion

There are some historic clues as to the dimensions of Indies ships, and they help to put the size of the St. Johns hull remains into perspective. García de Palacio outlined the dimensions of various types of sixteenth-century Indies vessels. As he described, “A ship of four hundred tons has thirty-four *codos* of keel (62.33 feet, or 19 meters), from the sternpost of the poop to the prow end of the keel, and for the beam, sixteen (29.33 feet; 8.94 meters), which is the almost half of the keel.... the ship of this size will

have eleven and a half *codos* depth of hold, which is one-third of the said keel” (1587: 267). (The *codo real* utilized by García de Palacio, was equal to 55.71 centimetres, or 22 inches (Loewen, 2007a: 17; Phillips, 1990:6).) García later describes a 150-ton vessel that also has a keel of 34 *codos*, but a beam of 14 *codos* and a depth of hold of eight *codos* (1587: 276-277) (Fig. 3.26). Another contemporaneous description, this time of rowed *galeones agaleradas* “of new invention” built by Pedro Menéndez as Indies guard vessels, shows they were also narrowly-proportioned: “The galleons of Your Majesty that the Adelantado Pedro Menéndez built for the guard of the Indies are of the size of two hundred tons, little more or less, because, although they have thirty-five *codos* of keel, the beam that they were given was small, of which they apparently have twelve and a half *codos*...” (Vargas, ca. 1570). The consistency in the length of the ships described in the historic accounts is interesting, but it does not appear to be reflected in the archaeological record.

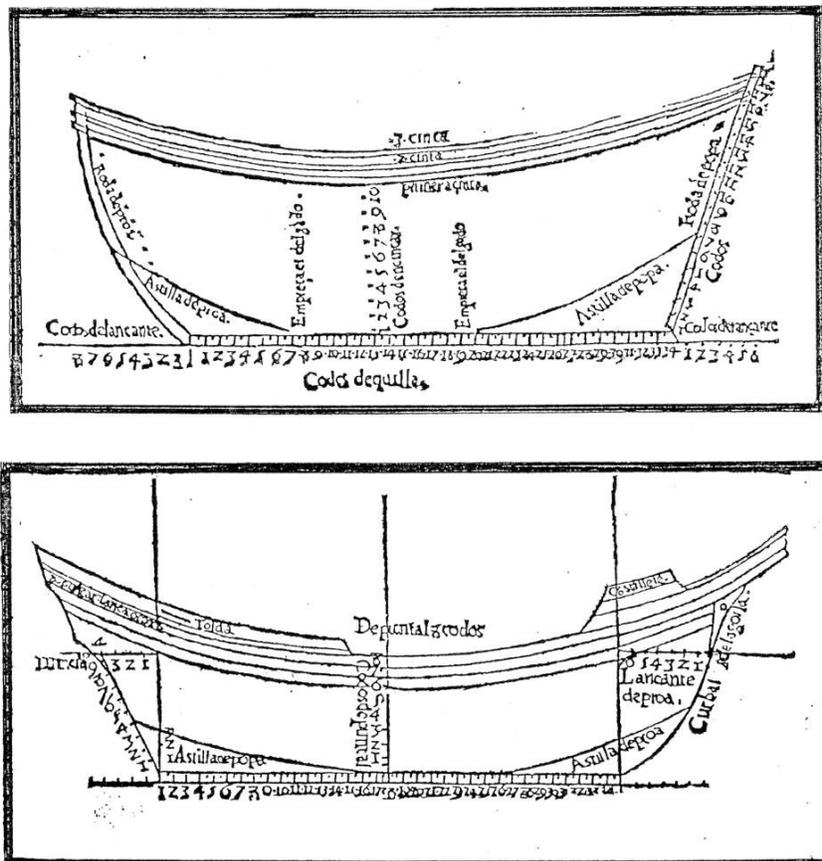


Figure 3.26. Diego García de Palacio’s side views of a 400-ton ship (top) and a 150-ton ship (bottom) with their dimensions noted in *codos* (1587 [1993]:274;280).

There have been studies done to look at the archaeological remains of early Spanish colonial shipwrecks to find commonalities between their hull structures, with the hope of determining if there was a type of ship created to cross the Atlantic. Thomas Oertling in his comparison of such sites found a set of eleven characteristics that are found on early Iberian Atlantic vessels (Oertling, 2001). These features, followed by notes regarding their applicability to the St. Johns wreck, are as follows:

- 1 – *“A given number of central frames, assembled before they were set up on the keel, whose futtocks are joined to the floor with a dovetail mortise and tenon, and transverse nails and treenails.”* The framing of the St. Johns wreck was simply too poorly preserved to show any sign of dovetail joints. There were two instances where iron nails were found driven transversely through the sides of futtocks.
- 2 – *“The carvel planking is fastened with a combination of nails and treenails joining plank and frame. The nails are at the plank edge on the frame centreline, and the treenails alternate across the centreline of the frame.”* This is true for the St. Johns wreck, where the iron nails were almost always closest to the edges of the planking; treenails, and sometimes additional iron nails were placed in-between.
- 3 – *“The aft end of the keel is a naturally grown knee whose upper arm is scarphed to the sternpost.”* The keel/sternpost intersection of the St. Johns wreck was not seen and most likely did not survive.
- 4 – *“A single piece of deadwood timber sits on top of the keel stern-knee.”* The deadwood area of the St. Johns wreck was not seen.
- 5 – *“The stern Y-timbers are tabbed into the deadwood knee.”* No Y-timbers or deadwood were encountered on the St. Johns wreck.
- 6 – *“The keelson is notched over the floor timbers.”* No portion of the keelson was found in any recognizable form on the St. Johns site.
- 7 – *“The mast step is an expanded portion of the keelson, part of which is cut away to seat the ship’s pump.”* No identifiable part of the keelson was found on the St. Johns site, let alone the mast-step.
- 8 – *“The mast step is supported by buttresses and bilge stringers.”* The mast step was not present on the St. Johns wreck.
- 9 – *“Ceiling planking extends just above the ends of the floor timbers where the last ceiling plank is notched to accept the short transverse filler planks.”* No ceiling planks appear to have survived on the St. Johns site.
- 10 – *“The ships have as part of their standing rigging a teardrop-shaped iron strop to accept a heartblock or deadeye, which is attached to 2-3 lengths of chain and the last link through an eyebolt.”* The St. Johns wreck utilized chains exactly like this as standing rigging.

11 – “*There is a flat transom stern with the sternpost proud of the transom face.*” The transom and sternpost of the St. Johns wreck have not been located and most likely did not survive.

Filipe Castro, in a more wide-ranging analysis of Iberian vessels of the early-colonial era, found legitimacy for Oertling’s “trait cluster” but stressed that many of these same qualities could be found in various combinations on ships of the same period from across Europe and the Mediterranean (Castro, 2008b). Castro notes that there were chiefly three types of Iberian sailing vessel used in the early colonies – the caravel, the nao, and the galleon – not-so-well understood ship-types that incorporated influences from across Europe and the Mediterranean and were characterized by similar proportions, a particularly-rounded amidships, pre-assembled central frames joined with dovetail scarphs, and an ambiguous “family resemblance” that likely extended even to vessels from areas beyond Iberia.

The resulting “score” of 2.5 of 11 matches for the St. Johns site compared to Oertling’s list of Iberian ship characteristics would, on the face of it, seem to show a poor correlation. But the reality is that the key hull remains were non-existent or too poorly preserved on the St. Johns wreck to know if these features were originally present on the ship, or not. What this comparison makes abundantly clear is that what survived of the St. Johns hull – largely exterior hull planking ranging from near the keel to just below the shroud chains - was a generally different area of the ship than what has typically been found on similar wrecks of the era.

Though the features found on the St. Johns site are not typical and perhaps not as diagnostic as others, they do offer information about the ship. Most notably, the dimensions of the wreck’s hull components give a sense of the size of the ship when compared to the other, similar vessels. Of the sixteenth-century Spanish Indies shipwrecks that have been archaeologically examined, the majority have yielded enough hull structure to determine or estimate their original size. As noted earlier, the hull remains of the St. Johns wreck spanned a length of 19.55 meters. But this part of the hull, the bulging “belly” of the ship, would have had a curve to it, and what is seen on the wreck has been flattened and elongated, so what it actually represents is a shorter length of the ship. The stone ballast found on the site covered a length of 25.3 meters, with *in situ* artefacts stretching beyond that, for a total site length of 29 meters.

Shipwrecks are subjected to a variety of forces that can affect their final distribution (Muckelroy, 1978: 165-182), but, aside from the degradation of the hull and the resulting flattening effect, the surviving portions of the St. Johns site were found to maintain much of their original arrangement.

The size and plan of the St. Johns hull, when compared to other shipwrecks of the era, gives an indication of just how big of a ship it was. Certainly, based on the existing remains, it is larger than ships such as the Molasses Reef wreck or the Highborn Cay wreck, which were both around 19 meters long, overall. But it is considerably smaller than the Emanuel Point I site, which had a hull that was 34.6 meters long. Given the tonnages of those ships were able to be calculated – Molasses Reef and Highborn Cay at 100-130 tons; Emanuel Point I at 418-441 – it is fair to say that, based on site size, the St. Johns ship fell somewhere between these size ranges.

If the dimensions of planking, frames, and keels – the scantlings – changed in correlation to the tonnage of the vessel, they should serve as a gauge to the size of the St. Johns ship. When the specific measurements of the various structural elements are compared, a narrowing of the size range might be shown. The relevant scantlings for the St. Johns wreck and other documented Spanish Indies shipwrecks are as follows:

| Measure/Shipwreck | SJW ¹ | MRW ² | HC ³ | EP1 ⁴ | EP2 ⁵ | 1554/SE ⁶ | RB/SJ ⁷ | WLR ⁸ |
|--------------------------|------------------|------------------|-----------------|------------------|------------------|----------------------|--------------------|------------------|
| Outside Planks | | | | | | | | |
| Width | 25-36.5 | 15-28 | 8 – 25 | 25 | 23 | N/A | 21-37 | 26-37 |
| Thickness | 4.7-7.5 | 5-6 | 6 | 5.5 | 5.5 | 10 | 5-6.5 | 3.5 |
| Floors: | | | | | | | | |
| Sided | 22.0 | 14-17 | 14-16 | 18-28 | | 21-25 | 19-21 | 16.6-22.3 |
| Moulded | N/A | 17-18 | 18-21 | 21-37 | | | 20 | |
| 1 st Futtocks | | | | | | | | |
| Sided | 20.3-21 | 16 | 14-18 | | 18-22 | | 16-19 | 11.3-18.6 |
| Moulded | N/A | 16-17 | 15-18 | | 16-18 | | 14-17 | 14-18.9 |
| Keel | ? | | | | | | | |
| Sided | 27 | | 15-16.5 | 31 | 30 | 31 | 20-56 | 17-23 |
| Moulded | 27 | | 21 | 29 | 27 | 27 | 24-27 | 15-22 |
| Length | N/A | | 12.6m | 23.5m | | | 14.73m | 9.32m (inc.) |
| Length | | Ca. 19m | 19.12m | 34.6m | 23m | 21-30m | 22m | 20.87m |
| Est. Tonnage | ? | 100-130? | 100-130? | 418-441 | | 164-286 | 250 | ca. 140 |

Table 3.3. Scantlings for Spanish Indies Shipwreck Sites.

Interestingly, planking widths do not appear to correlate to vessel size; most of the shipwreck sites, no matter the tonnage, had planking that averaged between 25 and 35 centimetres wide. Loewen has

¹ St. Johns Wreck

² The Molasses Reef Wreck (Keith, 1987:98-99; Oertling, 1989).

³ The Highborn Key Wreck (Oertling, 1987:42; Oertling, 1989).

⁴ The Emanuel Point I Wreck (Smith, Spirek, Bratten & Scott-Ireton, 1995: 44; Smith, 1999: 108)

⁵ The Emanuel Point II Wreck (Cook, 2009)

⁶ 1554 San Esteban (Rosloff & Arnold, 1984; Arnold & Wickman, 2010)

⁷ San Juan, Red Bay (Lowen, 2007a: 27,53,103; Grenier, 2001)

⁸ Western Ledge Reef Wreck (Watts, 1993; Bojakowski, 2012: 337; 432-434)

found that Biscayan colonial-era hull planking was commonly measured by the *codo de tabla*, a unit that measured 57.5 centimetres long by 38.3 centimetres wide and 7.2 centimetres thick. The width measure of 38.3 centimetres (16 *pulgadas*) was rarely exceeded, probably because it represented the maximum for efficient use of wood, considering the technology and tree sizes of the time (Loewen, 2007a: 109). Indeed, as can be seen in the scantlings of the Spanish Indies shipwrecks, the widest planks are 37 centimetres, slightly under the described 16 *pulgada* maximum, a narrowing that, on the Red Bay/*San Juan* site, Loewen attributes to the shaping of plank edges to receive caulking (ibid.). But as the planking scantlings also show, not all ships utilized the maximum width, and cross-comparisons of the dimensions reveal little bearing between plank width and vessel size.

Plank thickness is fairly consistent across the shipwrecks; most commonly it ranges between 5 and 6 centimetres, or approximately 2 *pulgadas*. On the St. Johns site, the most common measure was 5.8 centimetres. There are outliers seen, though, such as the 10-centimetre-thick planking on the 1554 *San Esteban* and the 3.5-centimetre-thick planking on the Western ledge site, variations that are not readily explained.

The dimensions of the floor frames do show a positive correlation with vessel size. The slightest floors are found on the smallest ships, the 100 to 130-ton Molasses Reef and Highborn Cay wrecks, and the stoutest are on the ca. 430-ton Emanuel Point I site. The floors for all ships range between 14 to 28 centimetres sided; 17 to 37 moulded. The one measurable St. Johns floor fragment was 22 centimetres, sided. There is less data available for the futtocks, but what is available suggests that their dimensions have a slightly positive correlation with vessel size. Almost all the futtocks that are found are on wreck sites of ships of less than 250 tons, and they ranged between 14-19 centimetres, sided and moulded. The two measureable St. Johns futtocks ranged between 20-21 centimetres, sided.

The last comparable hull component is the keel, and this key structural piece also has a positive correlation to vessel size. Only three shipwrecks had intact keels, and, unlike the historical examples cited earlier, their length increases with vessel size. The stoutness of the keel, though, which is measureable across most of the wrecks, is shown to generally increase with the size of the ship. The slightest, at ca. 16 x 21 centimetres, is seen on the Highborn Cay site, and the stoutest, at 30 x 27 centimetres, is found on the Emanuel Point I wreck. Assuming the St. Johns centreline timber fragment is the end of the ship's keel, it measures 27 x 27 centimetres, which is comparable to those on other wrecks in the 160 to 300-ton range.

Though the hull remains of the St. Johns wreck were primarily planks from the side of the ship, with few frames, no curvature, and were punctuated by damage from earlier salvage efforts, they were in their original positions, and their aggregate dimensions and configuration can be used to find a sense of the ship's size. When they are compared against historical and archaeological reconstructions of similar ships, an idea of where they would have been situated on a complete vessel, and their scale relative to ships of known size, can be envisioned. From comparing it against the scantlings of the known Spanish Indies shipwrecks, it is clear that the St. Johns ship was most likely a mid-sized ship: most of its measures compare to vessels of 200 tons and greater, but it does not appear to have been as large as a ship of over 400 tons.

To illustrate the relative size of the St. Johns remains, when a drawing of the hull and rigging is properly-scaled and superimposed onto a reconstructed side view of the 250-ton *San Juan* shipwreck from Red Bay, the partial St. Johns remains are nearly the same size as the reconstructed ship. They appear too large, even when accounting for curvature, because there is no room for Y-timbers and deadwood, etc., and the shroud chains are set too far away (Fig. 3.27, top). When the St. Johns wreck is projected onto a reconstruction of a 400-ton galleon, the hull remains fit inside the outline with more than enough room, but the wreckage looks to be a bit too small to match with full accuracy (Fig. 3.27, bottom).

All in all, the excavation of the St. Johns wreck revealed a considerable amount of wooden hull structure. But the remains were not from the most diagnostic part of the ship, showed some damage from earlier salvage, and were not-so-well-preserved, on top of that. Additionally, a row of iron shroud-chains that once helped to stabilize the mainmast and unify it with the hull are found close to their original position. The remains were largely exterior hull planking with a few fragments of framing, as would be expected for the side of the ship. One section of what appears to be a scarphed end of the keel was found dislodged from its original context, a location that was never determined. Analysis reveals that the *in situ* remains were from the starboard side of the ship, ranging from near the centreline timbers at the ship's bottom, to just above where the first and second futtocks meet, and they do not fully reach to either the bow or stern ends. There are other missing areas of the ship: there is no evidence of the stem, rudder, castles, decks or gun-ports. And the entire port side of the ship is gone, as it was exposed to the elements, and destroyed through time.

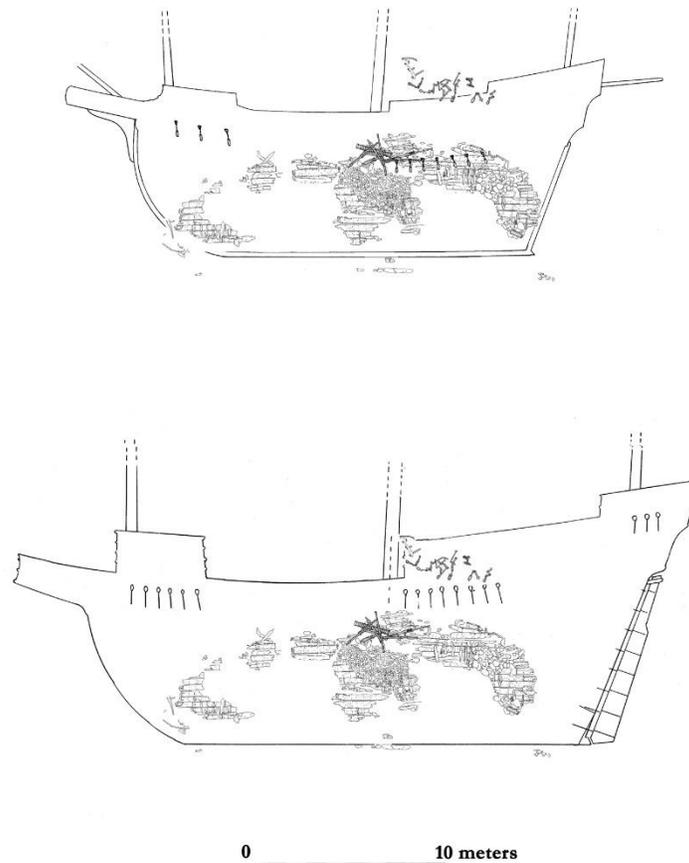


Figure 3.27. St. Johns hull remains compared to a side view of a reconstruction of the 250-ton Red Bay galleon. (Top; outline after C. Piper in Bradley (2007)), and a side view of a reconstruction of a 400-ton galleon (Bottom; outline after Raymond Aker (n.d.) copy on file at Mel Fisher Maritime Museum, Key West).

The area of hull found on the St. Johns wreck is not what has been typical of other Spanish Indies ships, which have tended to sink upright, sometimes in conditions more favourable for preservation, and typically have the areas from the lower hull – the keel to the turn of the bilge – preserved. These are the areas from which dimensions are much more likely to be calculated. Despite their limitations, the St. Johns remains do compare favourably to other Spanish-colonial ships of the era, and the available evidence suggests they come from a ship that was a square-rigged sailing ship of somewhere between 250 to 400 tons.

Chapter 4: ARTILLERY

When the St. Johns Bahamas Wreck was discovered, it was a quantity of wrought-iron guns that first signalled the site's presence. The pile of artillery was to remain a key feature of the site throughout the duration of the underwater field work. As the excavation progressed outward from the cluster of guns, many other pieces of weaponry and armour were discovered on the site, eventually constituting one of the largest categories of objects to be found on the wreck, and giving a strong insight into the armament of this particular ship and the nature of shipboard defence in mid sixteenth-century Indies ships.



Figure 4.1. Documenting St. Johns Wrought-Iron Artillery, 1999. (Photo: Dylan Kibler/MFMHS).

The collection of weaponry and armour recovered from the shipwreck is extensive and diverse. Artillery, in the form of three wrought-iron tube guns, eight wrought-iron versos, various breech chambers, and dozens of shot various of sizes and types forms the major part of the group. Nine steel crossbow prods, fragments of their wooden stocks, cocking mechanisms, triggers, and bolt heads represent this significant shouldered weapon. Portions of iron barrels, along with dozens of corresponding lead shot, give insight into the early form of the shoulder-mounted matchlock arquebus. Swords and evidence of

daggers are also seen. Pole arms in the form of bills and pikes round out the collection of weapons. Remains of iron helmets and iron breastplates were once used as armour by those on board on the ship.

All told, this group represents one of the largest and broadest collections of early Spanish-colonial arms and armour from any single site. It is a particularly significant representation of weaponry from a shipboard context, and with that particular circumstance, a tight date and narrow purpose. The items provide a “real-world” snapshot of the use of arms and armour on-board a *Carrera de Indias* ship in the early colonial period.

Adversaries

Pirates and privateers dubbed “corsairs” (*corsarios*) by the Spanish, appear to have been the earliest predators of Spanish New World shipping. According to the early historian of the Americas, Bartolome Las Casas, as early as 1498, Columbus was forced to alter his course when leaving Spain because he heard a group of French corsairs were waiting for victims to sail their way (Bourne, 1906: 319). Perhaps the most significant action against early Spanish-American shipping was Jean Florin’s successful capture of treasure garnered from Cortes’ conquest of Mexico. In early 1523, Florin intercepted the fleet near the Azores and captured two of the Spanish ships laden with exotic treasures from the newly-conquered Aztec kingdom (Diaz, 1576 [1844]: 135). Shortly after, he captured another ship bound to Spain from Hispaniola and laden with gold, pearls, sugar, and hides. Florin’s successful seizure of such a large fortune only opened the eyes of others looking to make a quick fortune, and, as a result, corsairs only became wider-spread problem as the sixteenth century progressed (Lane, 1998). Between 1548 and 1563, Spain lost at least 86 ships to corsairs across the Atlantic and Caribbean (Hoffmann, 1980:66).

In a dispatch sent to the governors and other officials of various provinces of the Indies on January 30, 1563, King Philip warned of a combined fleet of French and English pirates. He said, *“I have been given advice that certain French Lutheran corsairs are joining with some English with determination to take the defeat of Nombre de Dios and to run that coast with the intention of stealing and to make the damage they are able to”* (Philip II, 1563a). In a letter written some three weeks later, on February 18, the King sent a warning to Pedro Menéndez about a group of such corsairs heading to Tierra Firme: *“General Pedro Menéndez Knight of the Order of Santiago, and captains and masters of any ships that come from our islands of the Indies and Tierra Firme of the ocean sea, and to each and any of you, know that, through grace, we have had warning that eight large ships of Lutheran corsairs are in France, and for captain of them one who is called “Peg Leg” [pie de palo], leaving with the design of robbing the ships*

that are expected from those parts [the Indies], and to let you know this news, and [that] you shall come prepared, in good order, and appointed for war” (Philip II, 1563b).

It is not known how these corsairs were armed, but a hint of at least some of the types of weaponry they utilized comes in a list of items taken from a French corsair taken at Havana in 1564. The ship, of unknown size, was seemingly lightly-armed with two versos (with five accompanying breech chambers), five arquebuses, bows and arrows, swords, daggers, arm-shields, and helmets (Mazariegos, 1564).

Arming Indies Ships

As a result of steadily increasing traffic between Spain and the Americas in the early part of the sixteenth century, and a desire for safe, effective ocean crossings, the requirements for Indies ships became codified. In July of 1522, likely as a reaction of war with France and anticipating the incursions by French privateers on returning Atlantic ships, laws were issued for these trans-Atlantic vessels regarding size (ships of less than 80 tons could not sail to the Indies) and armaments. As for shipboard armaments, the decree of 1522 said:

“The said ship of 100 tons burden is to carry four large iron guns with their chambers doubled [two for each gun], and sixteen pasavolantes, eight for each side, and eight espingardas, and for each of the four large ones that have to go in the said ship, they are required to carry three dozen balls, and for each one of the pasavolantes, six dozen balls, and for the said espingardas carry a mould and lead in abundance to make the balls that will be needed, and two hundredweight of powder, and ten crossbows and two fexes [?] of darts, which are each of eight dozen, and four dozen throwing lances, and eight long lances, and twenty shields..” (Carlos I, 1522).

Starting in 1535, and reaffirmed in 1562 and 1573, regulations outlining the composition of crews and armaments required for each size of *Carrera de Indias* vessel were established; they apparently remained in effect across the following century (Carlos II, 1681: F45R-46R). These requirements have been distilled into table form (Table 4.1):

| Size of Ship | 120 tons (100 to 170) | 200 tons (170 to 200) | 250 to 320 tons |
|---------------------------------------|--|---|--|
| Crew | | | |
| Captain | 1 | 1 | 1 |
| Master | 1 | 1 | 1 |
| Pilot | 1 | 1 | 1 |
| Mariners | 18 | 28 | 35 |
| <i>Lombarderos</i> (Gunners) | 2 | 4 | 6 |
| Ship's Boys | 8 | 12 | 15 |
| Pages | 2 | 4 | 5 |
| Armament | | | |
| Demi-culverin | | 1 of 30 hundredweight; 30 balls. | 1 of 30 or 32 hundredweight, or 1 cannon of 40 to 42 hundredweight; 30 balls. |
| Saker of bronze | 1 of twenty hundredweight, plus 50 balls. | 1 of twenty hundredweight and 1 of fourteen hundredweight; 30 balls. | 1 of 20 hundredweight; 1 of 14 or 15 hundredweight; 60 balls. |
| Falconet of Bronze | One (plus 50 balls), plus one hundredweight of powder | One (plus 50 balls) | One of 12 hundredweight; 50 balls. |
| Lombards and <i>Pasamuros</i> of Iron | | 8, three of which shoot iron; two chambers for each. | 10, four of which shoot iron. |
| Large Pieces of Iron | 6, two which shoot iron; 20 balls of iron and stone for each, mounted on carriages, with "beaters" [<i>batidores</i>], sitting on axles and wheels, and pick-hammers to make the stones. | | |
| <i>Versos</i> | 12 of iron, [or] of <i>metal</i> (bronze), each with two chambers; 30 balls for each one. | 18, with two chambers each; 30 balls for each. | 24 with two chambers each, their "canes" [wedges?] and necessary dressings; 30 balls for each one (720). |
| Gunpowder | 9 hundredweight | 14 hundredweight | 18 hundredweight |
| Harquebuses | 12, with all of their equipment, and one <i>arroba</i> of powder | 20, with all of their equipment and lead for balls; two <i>arrobas</i> of powder. | 30, with all of their equipment and lead for balls; three <i>arrobas</i> of powder. |
| Crossbows | 12, each with 3 dozen arrows; two cords and two "fore-cords" [<i>avancuerdas</i>] each. | 20, each with 3 dozen arrows; two cords and fore-cords each. | 30, each with 3 dozen arrows; two cords and fore-cords each. |
| Large Pikes | 24 | 36 | 48 |
| Medium Pikes or Lances | 144 | 180 | 240 |
| <i>Gorguces</i> or Darts | 180 | 240 | 360 |
| Shields (round) | 12 | 18 | 24 |
| Breastplates | 12 | 18 | 24 |
| Helmets | 20 | 25 | 30 |

Table 4.1: Royal Regulations for Crew, Artillery, and Arms for Spanish Indies Ships.

With so many iron and bronze guns and a very large number of other weapons, far exceeding the number of crew, and only a few men dedicated to the artillery, it becomes clear that other members of the crew, and even passengers, too, would have to man guns and take up arms in times of conflict.

Eugenio de Salazar, a passenger on a 1573 Indies voyage, gives a good description of the scene that unfolded on board an Indies ship when it was thought to be under attack. When the vessel he was on came into contact with suspicious ships on the high seas, panic ensued, with some people screaming or hiding their valuables; the crew and some passengers, though, sprang into action. As Salazar described:

“To merchantmen, sailing as we were without escorting warships, any stranger is the object of suspicion; even the smallest may turn out to be a pirate. ‘Two sail,’ cried the look-out, and doubled our alarm; ‘three sail!’; and by this time we were convinced we had to deal with corsairs.... The gunner began to give orders to clear away for action; the ports were opened for the falcons and culverins; the guns were loaded and run out, and small arms were mustered...We all stood by with our weapons at the best points of vantage we could find – for the ship had no nettings – all ready to defend ourselves...” (1573 [1984]: 438).

Sometimes, though, Spanish ships were not so well-prepared, which left them vulnerable to the corsairs. In 1561, four ships sailing from Santo Domingo were captured, and in a reprimand to officials at Hispaniola, King Philip makes clear why they were taken; “...In March of this year, four vessels of this port, coming to these kingdoms, French corsair vessels ran into them close to Saona, and they took and robbed and mistreated the people who were coming in them, and the cause of their having been taken it is said was the four said ships did not come armed or gunned in conformance with the earlier ordinances of the Casa de la Contratación of the city of Seville. It seems from information that they have in our Council of the Indies that the artillery that they carried, they carried as ballast and under the deck, and the harquebuses and weapons [were] so badly kept that they were of no use, and that some of the said ships did not carry artillery, nor arms, nor swords, and that some of the crossbows they carried came without cords, and the harquebuses without powder.” (Philip II, 1561).

The situation of poorly prepared ships was not entirely remedied, though, and the practice of not fully complying with the maritime regulations continued. In 1565, royal reminders were sent to officials at the Canary Islands, a waypoint for Americas-bound Spanish ships, firmly instructing them that no ships were to sail from there to the Indies without conforming to armament mandates (Philip II, 1565d). And the practice of carrying artillery in the hold, rather than at the ready, remained a problem. One official

from Panama wrote to the king in 1568, warning of this dangerous habit, “In the above mentioned visit to the ships there is another concern that that the artillery that they carry is not mounted and placed as it should be for travel as Your Majesty orders it, but [it is] placed as ballast or between the merchandise, from which it results that if they [try to] avert enemies who have some force of artillery [the enemies] might win themselves the entire fleet” (Aguirre, 1568). Apparently, ship’s masters in the *Carrera de Indias* often found that it was acceptable, and worth any risks and vulnerabilities, to not carry the prescribed artillery or to even mount what artillery they did carry.

A History and Nomenclature of Early Wrought-Iron Artillery

Artillery underwent significant evolution in the sixteenth century, with overlapping sequences of gun-founding technologies. Artillery of wrought-iron, bronze, and cast iron are all found during this time. The sixteenth-century historian and Spanish military engineer Luis Collado summarized the history of artillery manufacture, as it was known near the end of the sixteenth century:

“[Wrought iron guns] are forged with incredible artifice, and great labour; many, and very thick, pieces of iron worked in the forge with a hammer. They were manufactured with wide, and very thick iron plates, and tightly for strength, and thick rings of the same, and in the same way as said, [this technique] began to be used in various parts of Europe, which, according to Nicolao Beraldo, he writes, were commonly called Bombards. The name consisted of these two Latin verbs *Bombo* and *Ardeo*, like a thing that rumbles fiercely and burns. But author Ricardo Bertolino asserted for another, modern moniker, and [one] even more suitable and proper; he calls the piece of Artillery “*Turrifraga*,” which means a thing that breaks the walls and the towers. And other, more modern authors call it “*tormento*,” a name taken from the said effect, and called the ball a “*tormentaria*” sphere, and “*magister tormentorum*” to the gunner overseeing the artillery...

But going on to a later time, and [when] the art of artillery was penetrating human understanding much more, and it was refined in such manner that they came to find that [in] the founding of iron [it] melted neither more, nor less, as bronze melts, from which they formed pieces of artillery, and they call them cast iron. The smelting of [artillery] pieces was for some years valued in Europe, and had been taken in great esteem.

But thinking forward through time, the ingenuities of men were more refined in this exercise, and seeing one, and another, the founding of [iron] artillery was said to be of little effect, easily broken, and very dangerous. They found the composition of copper with tin, which most ones called

“*fusilera*,” and others “*bronzos*,” and from this mixture, innumerable pieces of artillery were formed. To which ones the names were put that more aggravated their authors. But for the most part they attributed them to the birds of prey, and other fierce and venomous animals of nature, as are *Esmiriles*, *Falconetes*, and *Pasavolantes*, *Sacres*, *Aspides*, *Culebrinas*, *Serpentinos*, and *Basilicos*, with many other names, which, to not be prolix, we shall stop naming all of them.” (Collado, 1592, F.6-6V).

An early description of wrought-iron guns comes from Biringuccio’s *Pirotechnica* (1540 [1990]), a treatise on sixteenth century metal industries that also discusses the history of artillery manufacturing. As Biringuccio notes, “They have made them large and small, combining various lengths and shapes, and have called them by various names. Thus it is possible to say of the guns that we call antique as well as those that are modern to us today, I have never found a uniform size in any kind that is seen.... I see only that one wished to make them long with a small ball, like the *cerbottane* or a little larger, like the *passavolanti* and basilisks, or another wished them short, like the spingards, mortars, cortalds, cannons, bombards, and similar ones. In short, it seems to me that in every age men have proceeded to make, and still today make, them as they think will be best for their purposes, or according to the wishes of whoever has them made or of the masters who make them.”

Based on a survey of the historical literature and collections of ancient Spanish artillery, Jorge Vigón was able to classify the often confusing forest of ancient names for wrought-iron artillery. As he described it, the varied and inconsistent styles of guns were the result of the differing skills of the builders, their imaginations, and the vagaries of fashion, and adding to the confusion is a myriad of honorific names based on places, saints, people, or simply the picturesque. This meant that similarly-designed guns often had different names. But according to his observations, and frequently utilizing the calibre of the gun (bore-diameter to barrel-length ratios), Vigón (1947) describes the classes of wrought-iron artillery as follows:

Bombarda* or *Lombarda – These guns come in small, medium, and large varieties, but their most distinguishing characteristic is that they rarely exceed 12 calibres in length.

Bombardeta – these guns have a smaller bore diameter than the *bombarda*, and they are proportionally longer, usually between 15 and 30 calibres.

Pasavolante – This is a later variant of the *bombarda* (perhaps even a medium type), with a similarly large bore and relatively short length. The *pasavolante* usually has a bore between 15 and 20 centimetres in diameter and 14 to 16 calibres in length. Toward the end of the fifteenth century, the

pasavolante changed; it was considerably elongated, with a smaller bore of approximately 10 centimeters and a length up to 60 calibres.

Cerbatana - They were pieces of small bore, between 2 and 7 centimetres, and of great length: some examples were up to 40 calibres long and no less than 25.

Ribadoquín - An intermediate piece between the *bombardeta* and the *cerbatana*, with a smaller diameter and length of 20 to 30 calibers. *Ribadoquines* can be classified as large, medium, and small; the first are quite similar to the *cerbatanas*; the medium-*ribadoquines* are of sometimes up to five centimetres diameter, and of great length. *Mosquetes* [muskets], *esmiriles*, and *espingardones* are closely-related with *ribadoquines*.

Falconetes - These are slight and easily transportable pieces, of different appearance from the other examples. The barrel extends [forward] from a cylindrical body of greater diameter, and it ends [rearward] in a frame. This frame has openings in the sides, through which a wedge of iron goes behind to hold a breech-chamber, which enters the barrel. Two trunnions attach to the barrel, to which a yoke holds, and [the yoke] ends in loops that serve to hold the *falconete* in its assembly. Without the breech-frame and the head that lengthens it, the barrel usually measures one meter and reaches 1.50 and 1.60 meters in some cases. Its bore diameter varies from five to seven centimetres. A variety of these sorts of pieces are *versos*.

Artillery on the St. Johns wreck

It has been said that, in general, the known wrought-iron artillery is of poor provenance, with little known about the date, type, or performance of the pieces (Devries & Smith, 2005:7). The examination of the St. Johns collection of wrought-iron guns will work to change that.

The artillery found on the St. Johns Bahamas wreck is composed entirely of wrought-iron pieces. These guns vary in design and intended deployment. Biringuccio's observation that guns were designed using criterion "best for their purposes, or according to the wishes of whoever has them made or of the masters who make them," holds true in the case of the St. Johns wreck guns; they are not uniform in design and appear to have been made by more than one maker for various purposes. By examining the collection, we can get a sense of how these guns compare to the historical and archaeological records and how this artillery might have been used on the ship.

Tube Guns

The largest of the ship's guns found on the St. John's Bahamas wreck are three wrought-iron gun tubes. These guns are the most cannon-like of the artillery on the site, but, with their alternating bands and hoops, they appear segmented, and they differ considerably from the cast metal variety of cannon

familiar to most people. These wrought-iron guns, known generically as *bombardetas*, were breech-loaded and required a separate powder chamber to be wedged against the barrel tube in order to be fired.

The guns from the St. Johns Bahamas wreck have undergone years of conservation treatment and are now fully stabilized. Some of the original surfaces have been lost, revealing striations in the wrought-iron, which in turn reveals the individual components used to construct the pieces. The tube guns are built much like wooden casks or kegs: Iron staves the length of the barrel are placed edge to edge, forming a cylinder over which a series of narrow hoops and wider sleeves have been wrapped around or driven over. These reinforcement bands serve to bind the staves, making the barrels resistant to explosive internal pressures. All this is in line with Collado's description of thick iron plates and rings assembled tightly for strength.

There are many components common to the large guns and the breech chambers recovered from the shipwreck, and the terms illustrated below (Fig. 4.2) will be used in the following descriptions of the tube guns. These terms are adapted from nomenclatures devised for hooped guns by Smith (1988), and Simmons (in Keith, 1987:180), combined with features particular to the St. Johns collection.

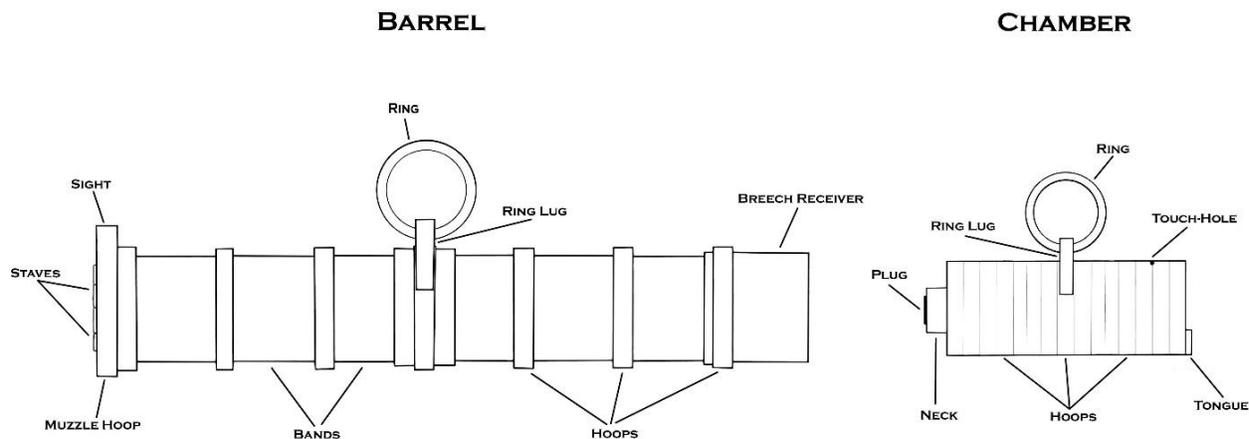


Figure 4.2. Nomenclature for wrought-iron tube guns and their breech chambers.

Wrought-iron Gun Tubes recovered from the St. Johns Bahamas Wreck

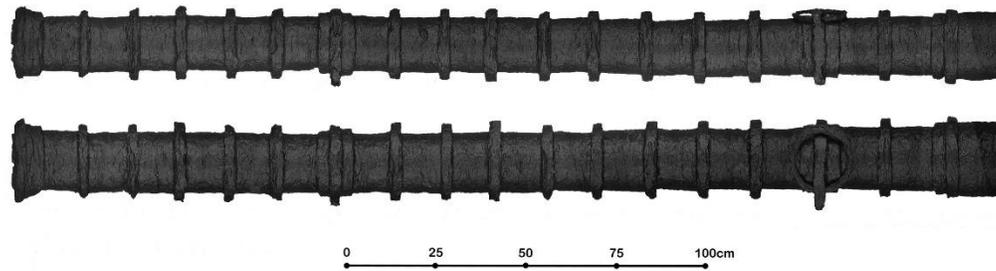


Figure 4.3. Barrel tube 92-1186. (Photo: Cameron Hutchins/MFMHS).

Barrel tube 92-1186 has a length of 279 centimetres and a bore diameter of 9.1 centimetres, for a span of 30.66 calibres. It is made of 56 pieces of iron, including five staves bound by 25 hoops and 17 bands. Two pairs of lifting rings were attached by lugs welded to the top of the barrel, one at 89 centimetres from the muzzle, and another at 47 centimetres from the breech end.

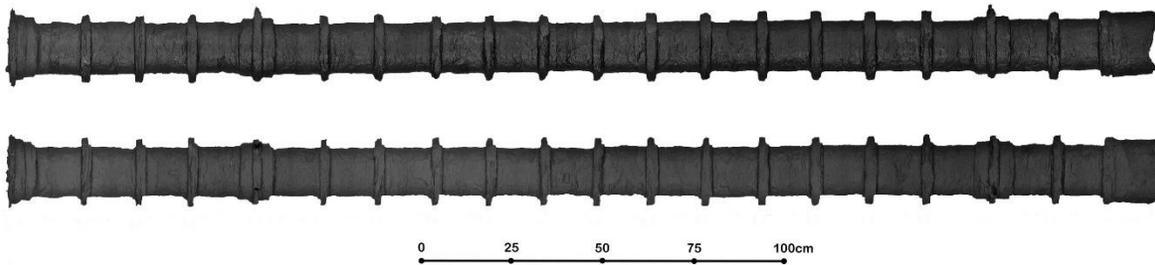


Figure 4.4. Barrel tube 92-1187. (Photo: Cameron Hutchins/MFMHS).

Barrel 92-1187 is longer and slimmer, with a length of 322 centimetres, and a bore diameter of 8.3 centimetres; a length of 38.8 calibres. It was made from 64 pieces of iron: ten staves, 45 hoops and bands, four lifting rings, four lugs, and a breech receiver. One pair of rings was attached by lugs at 67 centimetres from the muzzle and the other at 47 centimetres from the breech. An interesting feature was noted on this barrel - a coating of what appeared to be pitch covered the forward part of the tube, running from the muzzle to 45 centimetres back; an apparent anti-corrosive or waterproofing measure, since this portion of the gun would have been outboard of the hull during firing, and more exposed to saltwater. Unfortunately, this coating had to be sacrificed for the proper conservation of the gun's iron, and it was not preserved. There was no evidence that the other barrels were treated similarly.

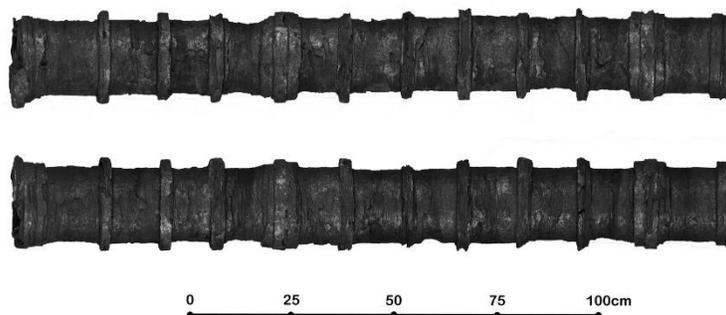


Figure 4.5. Barrel tube 99-2798. (Photo: Cameron Hutchins/MFMHS).

Barrel 99-2798 is the shortest tube of the three with an overall length of 174.2 centimetres, and it has the largest bore at 12 centimetres. This gives the tube a proportional length of 14.52 calibres. This gun-tube was originally constructed of 42 separate pieces of iron. It consists of six iron staves and twenty-eight hoops and bands. There is no breech receiver, and there are no surviving lifting rings, only the slightest weld-scars from four iron lugs that once held them. The muzzle is differentiated from the breech by a slightly pronounced “sight” at the top of the foremost muzzle-hoop, though this is by no means a certain distinction.

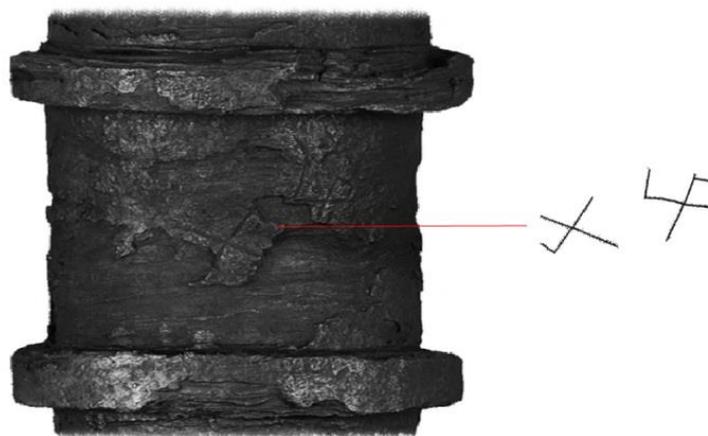


Figure 4.6. Detail of a mark cut into the surface of barrel 99-2798.

A mark was chisel-cut into the gun at the second band from the muzzle. What remains of this detail is only a fragmentary pattern of a diamond-shape and angular lines; the significance is not known.

Tube Gun Chambers

There would have been more chambers than gun tubes carried on the ship, and additional evidence for this is seen on the site in the form of approximately six chambers concreted together as a large, single mass, and five other chambers scattered singly through the southern end of the wreck. The size of the fused mass of breech chambers, and the difficulty in successfully recovering and conserving it, precluded its recovery; it remains on site (Fig. 4.7).



Figure 4.7. Side view, looking west, of a fused mass of ca. six large breech chambers, ceramic sherds, and ballast stones near the 0 datum of the St. Johns site. This conglomerate was too heavy to recover and remains on site. (Photo: Dylan Kibler/MFMHS).

Four large breech chambers were recovered, though, and they vary considerably in size and design. In general, these chambers are much more heavily constructed than the tube barrels, with only reinforcing hoops, and no intervening wider bands, butted side-by-side over a cylindrical core. The chambers all have iron lifting rings, or at least the evidence that rings once existed.

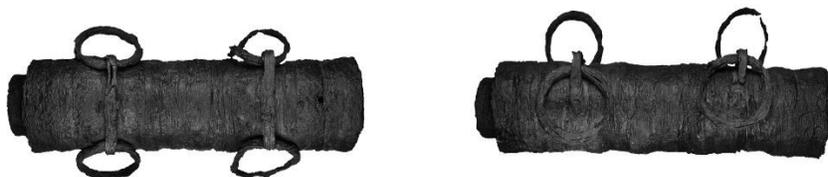


Figure 4.8. Breech Chamber 91-030. (Photo: Cameron Hutchins/MFMHS).

Chamber 91-030 has an overall length of 73.5 centimetres and a weight of 102 kilograms (Fig. 4.8). The bore is 6 centimetres in diameter, and 64 centimetres deep where it is joined by the touch-hole. The volume of the chamber is ca.1810 cubic centimetres. While it was being conserved in the laboratory, the mouth of this chamber was found to be sealed by a wooden plug. When the concretion covering the bore came away from the muzzle, pressurized gas escaped from inside the chamber. The wooden plug was carefully removed, revealing contents of 480 millilitres of a liquid (presumably saltwater), and 390 grams of powder (dry weight). As the cleaning continued, the touch-hole was found, and it was plugged with fibrous material. There was no shot contained in this loaded charge.



Figure 4.9. Breech Chamber 96-2152. (Photo: Cameron Hutchins/MFMHS).

At 74.5 centimetres, breech chamber 96-2152 is the longest of those recovered from the site (Fig. 4.9). It has a bore of 6cm diameter, 59cm deep, for a volume of 1668 cubic centimetres. The neck protrudes 4cm from the body of the chamber. Weld scars for lifting rings are found at 19.8 centimetres from the muzzle, and 21.5 centimetres from the breech end.



Figure 4.10. Breech Chamber 95-0151. (Photo: Cameron Hutchins/MFMHS).

Breech Chamber 95-0151 has an overall body length of 64 centimetres (Fig. 4.10). A neck of 8.8 centimetres dia. extends from the muzzle some 2 centimetres, but this protrusion is corroded and was originally a bit longer. The chamber has a bore of 5.4 centimetres dia. and 59.5 centimetres deep, with a volume of 1363 cubic centimetres. There is a remnant of a tongue protruding from the base, which served to hook underneath the wedge driven behind the chamber, locking it in place for firing.



Figure 4.11. Breech Chamber 93-1351. (Photo: Cameron Hutchins/MFMHS).

Chamber 93-1351 is quite different from the others in that it has a single, fixed loop handle forged to the body, creating a mug-like appearance (Fig. 4.11). The body itself has a conical shape that tapers towards the mouth. A tongue designed to hook under any wedge driven behind the chamber extends from the base of the piece, opposite the touch-hole. Despite a similar form to the verso chambers, this example is much too large for use in the much smaller rail-guns. Chamber 93-1351 has an overall length of 58.5 centimetres. The bore diameter is 7.3 centimetres and is 52.5 centimetres deep, with a volume of ca. 2197 cubic centimetres. There was no evidence of a wooden plug or any gunpowder loaded in this piece. Similarly-designed chambers have been found mounted in position with wrought-iron tube guns recovered from two different sixteenth-century sites at Anholt, Denmark (Howard, 1986), so though this type of chamber is not known from any other Spanish colonial context, there is precedent for it elsewhere.

Much like St. Johns chamber 91-030, plugged and loaded breech chambers were recovered from the 1554 fleet wrecks at Padre Island, Texas, and they, too, suffered from saltwater intrusion. The powder that remained proved to be only the charcoal; the saltpetre and sulphur had been leached away by the water (Arnold and Weddle, 1976: 252). This appears to be the case with the St. Johns gunpowder, as well. Though the powder sample is not intact, it is known that a variety “recipes,” all using varying proportions of charcoal, sulphur and saltpetre, were used in sixteenth-century Spanish artillery. A wide range of sixteenth-century mixtures for black powder are detailed in Cristobal Espinosa’s *Alvaradino* (1584):

Common gunpowder - Saltpetre three pounds; Sulphur ten ounces; Charcoal ten ounces.

Good – Saltpetre four pounds. Sulphur eleven ounces. Charcoal eleven ounces.

Best – Saltpetre five pounds. Sulphur one pound. Charcoal one pound.

Refined – Saltpetre nine pounds. Sulphur one pound. Charcoal fifteen ounces.

Fine – Saltpetre six pounds. Sulphur one pound. Charcoal 14 ounces.

Coarse powder for Artillery – Saltpetre one hundred pounds. Sulphur twenty pounds. Charcoal twenty-five pounds.

Powder for muskets – Saltpetre one hundred-twenty pounds. Sulphur twenty-five pounds. Charcoal thirty pounds.

Carriages

No evidence has been uncovered for carriages or other sorts of mountings for the St. Johns tube guns. But similar tube guns, mounted in wooden cradle-like carriages, have been recovered from other sixteenth-century shipwreck sites. Bombardeta barrels recovered from the wrecked 1554 *Nueva España* fleet near Padre Island, Texas exhibited the same system of lashing over fragmentary and poorly preserved remains of wooden carriages (Arnold and Weddle, 1978: 246). Other shipwrecks in European and English waters show better preserved examples of a similar carriage design. On the Villefranche wreck of ca. 1516 (Gerout, Reith, Gassend and Liou, 1989) and on the *Mary Rose*, wrecked 1545 (Rule, 1982: 159-160), wooden carriages were mounted on two small wheels for manoeuvrability. In both these instances the barrels were lashed with rope to the carriages. The tube guns (eight guns total) from the two sites near Anholt, Denmark were all fixed to their carriages with iron straps placed at various points along the length of the tube (Howard, 1986). In all of these instances, the carriages were long, solid wooden beds with dugout centres on which the barrel tubes rested. There was space at the butt-end of the tube for the chamber to be wedged.

Versos

Eights complete examples of smaller, wrought-iron guns called “versos” have been recovered from the St. Johns Bahamas Wreck, along with two significant fragments of other specimens. Versos were breech-loaded rail guns mounted on a pivoting yoke, which gives rise to generic term “swivel gun” often used to describe them. This class of gun fired iron balls, lead/iron composite balls, or loads of scatter shot, and they would be used in close-range fighting to “sweep the deck” of an enemy vessel or to repel boarders.

These guns were also breech-loaded, with a handled, wrought-iron powder chamber, somewhat resembling a beer stein, holding the charge (Fig. 4.12). The chamber was placed in a receiver at the butt end of the barrel and held in place for firing with an iron wedge. As with the tube guns, the chamber is the part of the assembly that actually fired, with the barrel simply acting as a guide to deliver the ball in the desired direction. Multiple examples of verso breech chambers and wedges have been found on the St. Johns wreck and recovered.

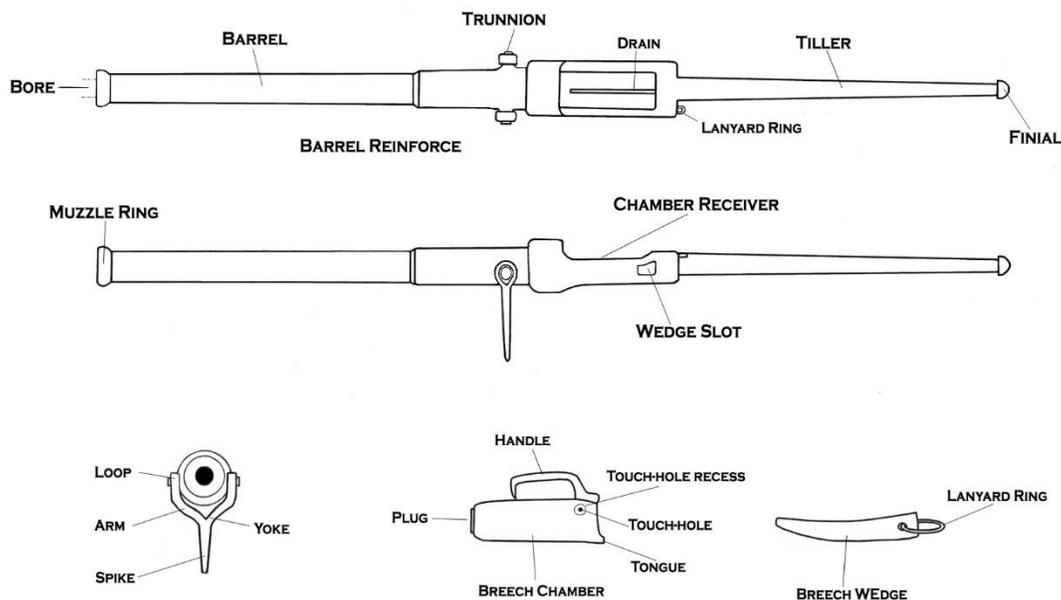


Figure 4.12. Nomenclature for versos, their breech chambers, and wedges. (Adapted after Simmons (in Keith, 1987:198)).

As was noted by Vigón, versos were derived from the rail-mounted, *falconete*-class swivel guns. The *falconetes* had barrels with hoop-and-stave construction, much like tube guns. Versos were most commonly made of wrought-iron, with a barrel fashioned from a single flat plate of iron forged into a barrel, which was forged to a separate chamber receiver and a long tiller handle, used for aiming. Keith, in a study of the versos recovered from the early sixteenth-century Molasses Reef wreck at the Turks and Caicos Islands, noted differences of size and design, and classified these guns into three groups (1987:200-203). First, are the *versos normales* [normal versos], which were the most common from the wreck. Second, were *versos dobles* [double versos], which were longer and generally more stout than the *verso normal*. Third are the *versos lisos* [smooth versos], which have a chamber receiver and barrel built of one piece of iron and whose lines flow together. In general, an intact verso is approximately two meters in length. In ways similar to the Molasses Reef wreck and other Spanish Indies sites, the designs of the versos in the St. Johns collection vary.

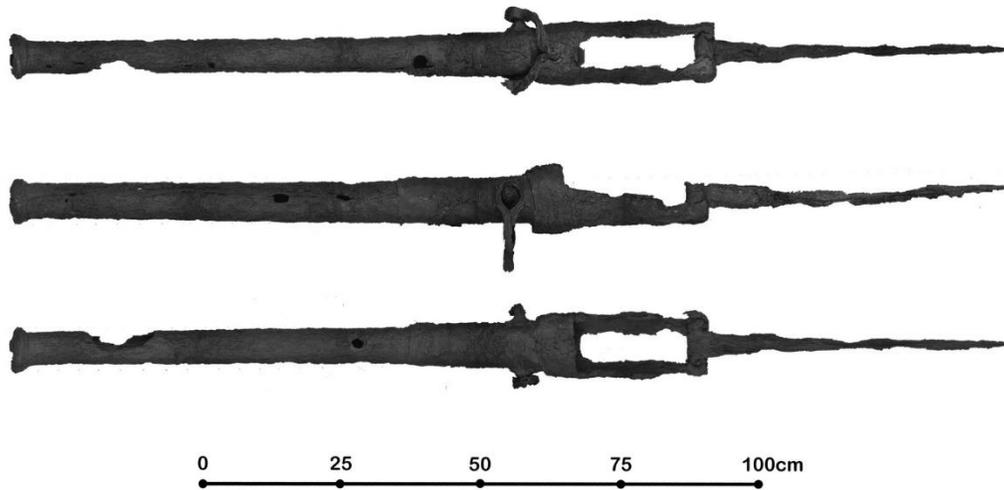


Figure 4.13. Verso 91-028. (Photo: Cameron Hutchins/MFMHS).

Verso 91-028 has an overall length of 198 centimetres and a bore diameter of 4.6 centimetres (Fig. 4.13). This verso has a barrel reinforce that runs 23.5 centimetres toward the muzzle from the front of the breech receiver. The relatively intact 54.5 centimetre tiller of this verso originally ended in a knob, which was lost in the conservation of the gun. There is a wide drain slot at the bottom of the breech receiver.

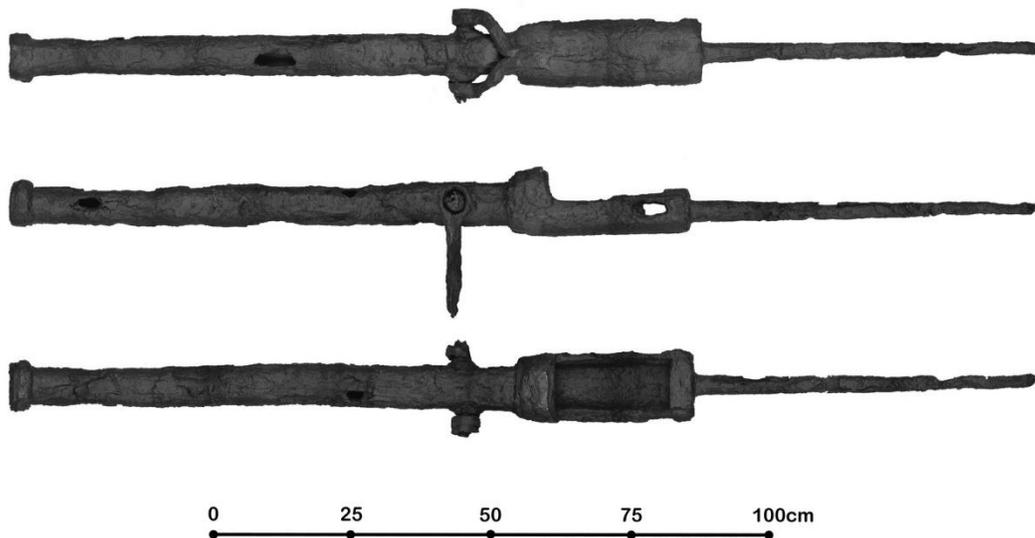


Figure 4.14. Verso 92-1189. (Photo: Cameron Hutchins/MFMHS).

Verso 92-1189 is a verso *normal* variety, with a separate chamber-receiver forged onto the barrel (Fig.4.14). It has an overall length of 187 centimetres, with a tiller of 62 centimetres, a breech-receiver of 32 cm, and a barrel of 93 cm. The bore is 4.5 centimetres. The tiller has no finial.

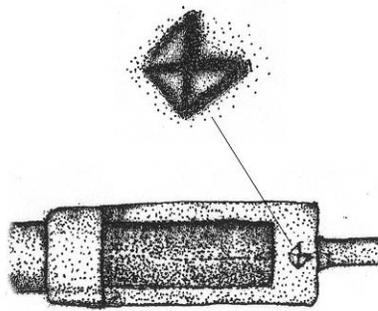


Figure 4.15. Detail of mark found on verso 92-1189 (Drawing: Robert Cummings/MFMHS).

There is a cross-within-a-diamond mark hammered into the top surface of the rear of the breech receiver. The significance of this mark is unknown.

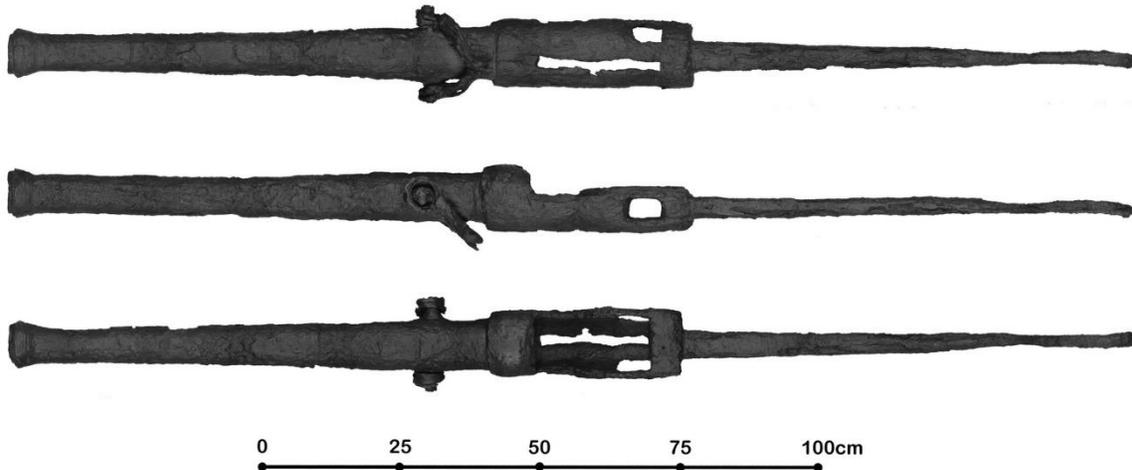


Figure 4.16. Verso 92-1240. (Photo: Cameron Hutchins/MFMHS).

Verso 92-1240 is another example of the *verso normal* style (Fig. 4.16). It is 205 centimetres long, including a nearly complete 81 cm long tiller. The bore of this gun is 3.8 centimetres. The barrel is 88 centimetres long, and the breech receiver is 36.5 centimetres. This verso has a long drain that runs 21.4 cm along the bottom of the chamber receiver. The tiller has no evidence of a finial.

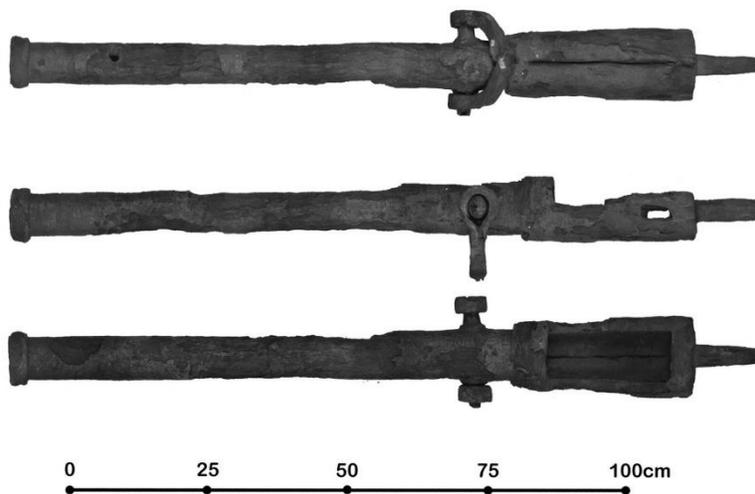


Figure 4.17. Verso 97-2741. (Photo: Cameron Hutchins/MFMHS).

This is one of the shorter versos in the group, with an overall length of 138.5 centimetres, including a partial 12.2 cm tiller (Fig.4.17). This gun is similarly proportioned to verso 99-2796. The bore is 4.1 cm in diameter. A drain slot runs 25.5 centimetres along the bottom of the breech receiver.

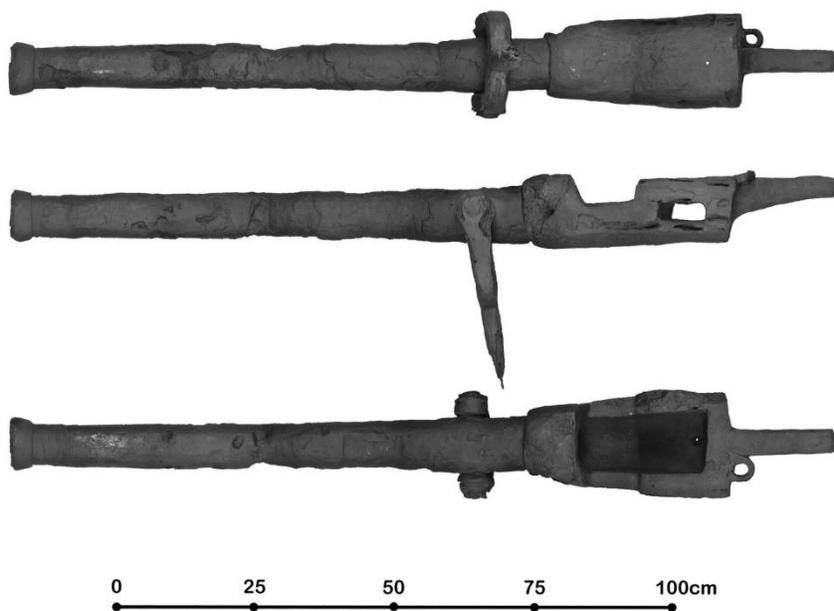


Figure 4.18. Verso 99-2795. (Photo: Cameron Hutchins/MFMHS).

Verso 99-2795 is the best-preserved verso within the St. Johns collection (Fig.4.18). It also appears to be the biggest of the group, though it is still a *normal* type gun. It is 149.8 centimetres long, including a partial tiller of 17.5 centimetres. The bore is 4.0 centimetres in diameter. A small, 0.5 cm diameter drain

hole is at the bottom of the breech receiver. This verso has a lanyard loop forge-welded to the left side of the base of the tiller, where it meets the breech receiver.

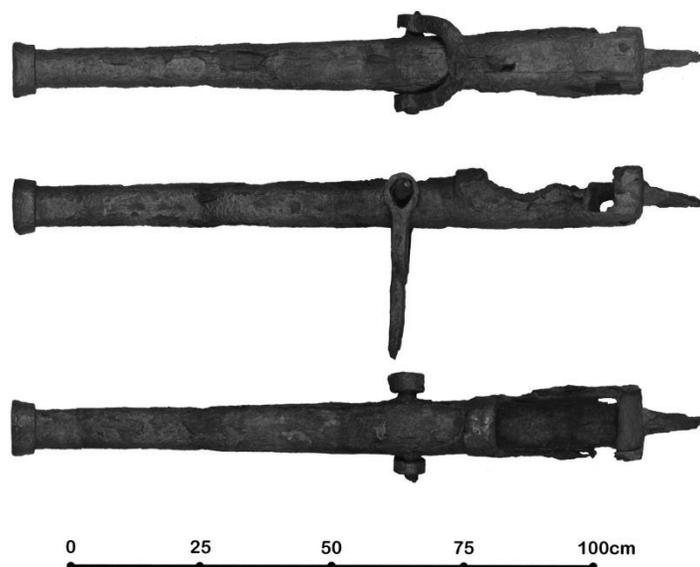


Figure 4.19. Verso 99-2796. (Photo: Cameron Hutchins/MFMHS).

Verso 99-2796 appears to be a hybrid-style gun in that it is constructed like a *verso liso*, with the chamber receiver and barrel built as one, but it also has an added reinforce plate welded at the upper, forward part of the receiver (Fig.4.19). The gun is 133.6 centimetres long, including a partial tiller of 12 centimetres. This verso has a bore diameter of 4.8 centimetres. There is no sort of drain in the chamber receiver.

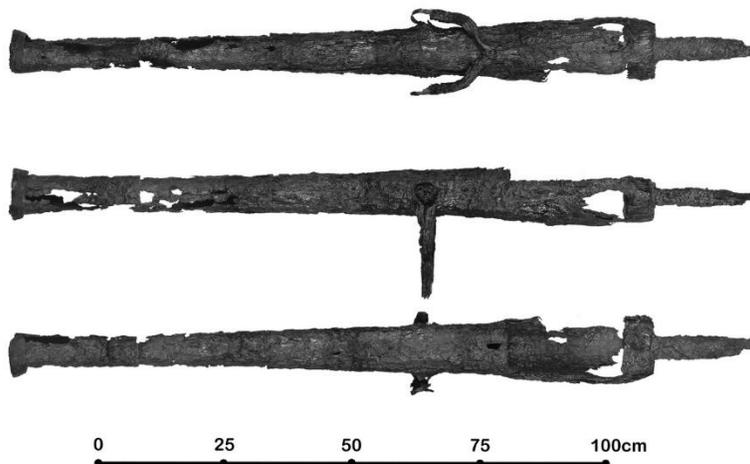


Figure 4.20. Verso 92-1188. (Photo: Cameron Hutchins/MFMHS).

Verso 92-1188 is a *verso liso* (smooth verso) distinguished by its smooth lines as the barrel and breech receiver are fashioned from a single piece (Fig.4.20). This gun is poorly preserved. It has an overall length of 149cm, including a partial tiller of 20.5 centimetres. The bore diameter is relatively large, at 5.9 centimetres, though this figure might be a bit larger than it was originally, due to corrosion. There is no evidence of a drain in the chamber receiver.

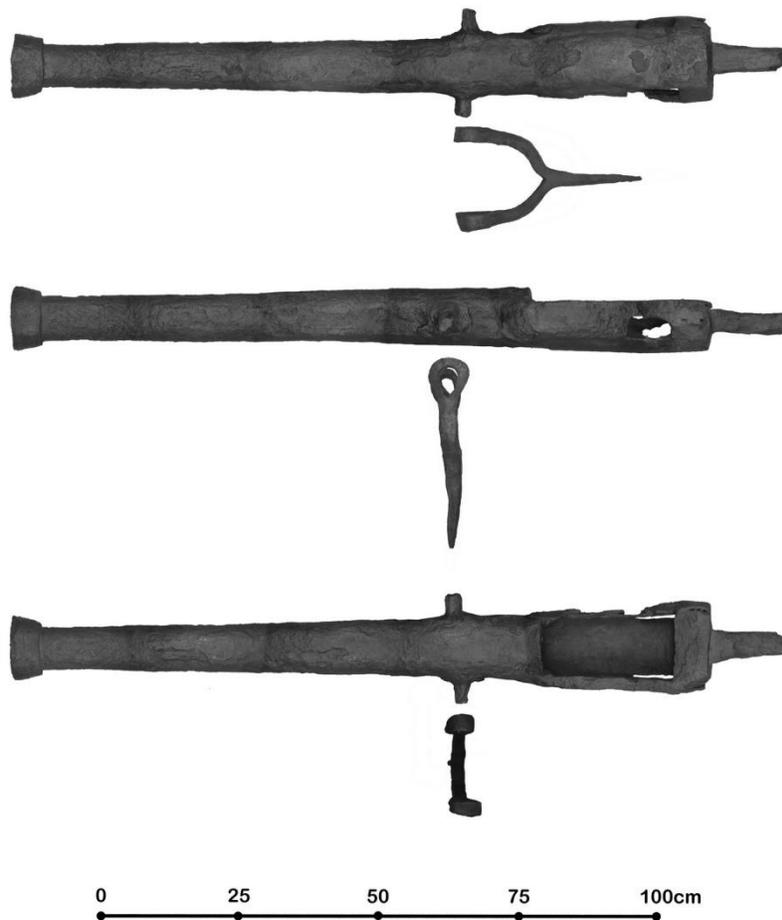


Figure 4.21. Verso 99-2797. (Photo: Cameron Hutchins/MFMHS).

Verso 99-2797 is another of the smooth, *verso liso*-type guns in the collection (Fig.4.21). It is 143.7 centimetres long, including a partial tiller of 15.5 centimetres. The bore of this gun is 5.5 centimetres in diameter. There is no drain.

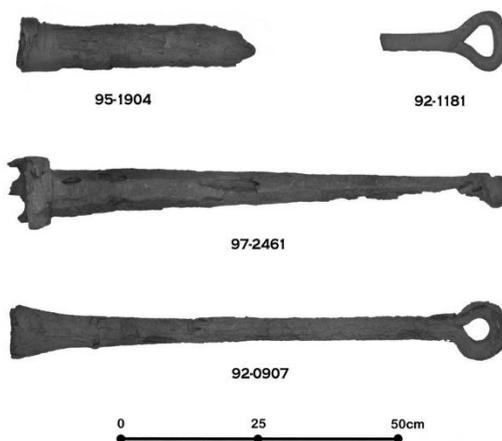


Figure 4.22. Various Broken Verso Parts. (Photo: Cameron Hutchins/MFMHS).

Various broken pieces of versos were found on the site (Fig. 4.22). Most of these are substantial and could not have originated from any of the other eight versos described earlier. Perhaps the most curious of these pieces is a large tiller attached to the back end of a breech receiver (97-2461), with an overall length of 92.5 centimetres. The tiller is hexagonal in cross-section, 8.5 centimetres wide at the base, 84.5 cm long, and finished in a knob 8.5 cm in diameter. This piece was found at the very bottom of the pile of versos and tube gun initially discovered in 1991. It was alongside the west side of the tube gun and buried under three other versos; there is no indication of the remainder of the gun. It appears that this large tiller/breech-receiver section represents a verso that was damaged in antiquity and this remaining portion, for whatever reason, was being carried with the other guns. One other piece (95-1904) is a 43.5 centimetres section of the muzzle end of a barrel, with a bore of 4.4 centimetres in diameter. This piece of verso barrel could conceivably be a matching part of the isolated tiller, though it was found some 7.5 meters to the northeast of it, and there is still no middle section that would join these two extreme ends of a gun.

The two other pieces are assumed to be verso tillers, though this identification is not definite. One is a 91 centimetres long, 3 centimetres thick flat bar, with one end flared to 10 centimetres; the other end is finished in a loop 11 centimetres in diameter. This piece was found alongside tube gun barrel 92-1186. There is no verso that apparent tiller matches with. The other piece (92-1181) is a 10.8 centimetres wide, teardrop-shaped loop, attached to a bar 3 centimetres wide and 4.3 centimetres thick. It is thought to be broken from the end of a tiller, though it is not clear which verso, if any, it might originate from. Broken portions of versos were also found on the 1554 fleet shipwrecks, and these pieces were thought to have been stowed as ballast (Arnold & Weddle, 1978: 298-300).

Verso Breech Chambers

These powder chambers are cylinders built of a single planchet of iron, wrapped around an iron-base plug, and they generally have an iron handle welded to the outside surface. There is often a protrusion at the base to hook under the wedge driven under them, as a way to prevent them from escaping when fired. These chambers are pierced with a touch-hole near the base, and they have open mouths through which powder was loaded. These mouths also served as the outlet for the explosive blast directed down the barrel. The verso chambers from the St. Johns wreck are of the same general size, but they do have some stylistic differences that suggest they were made by different makers.



Figure 4.23. (L) Verso Breech chamber 1216 Side view and top. (R) Star mark chiselled forward of the touch-hole. (Photo: Cameron Hutchins/MFMHS; Drawing Robert Cummings/MFMHS).

Breech Chamber 92-1216 is 21.8 centimetres long and 7.5 centimetres wide at the base. It has a bore of 4.5 centimetres in diameter, by 18.5 centimetres deep, with a volume of 294 cubic centimetres. This well-preserved specimen has a circular recess surrounding the touch-hole, and just forward of this a simple, six-pointed star is chiselled as a mark (Fig. 4.23). A pronounced tongue protrudes from the base of this breech chamber (Fig. 4.24).

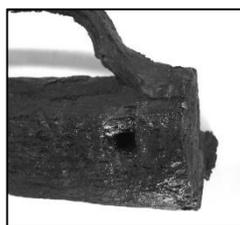


Figure 4.24. A 3-centimetre-wide tongue protrudes 1.5 cm from the bottom of the breech 92-1216, opposite the touch-hole.



Figure 4.25. Verso breech chamber 0029 Side and top views. (Photo: Cameron Hutchins/MFMHS).

Breech chamber 91-0029 is poorly preserved, but its dimensions can still be documented: it is 19.5 centimetres long and 8 centimetres diameter at the base (Fig. 4.25). There is no indication of a handle, probably a result of its corrosion. The bore is 5 centimetres in diameter by 18 centimetres deep, for a volume of 353.5 cubic centimetres.



Figure 4.26. Verso breech chamber 0866 side and top views. (Photo: Cameron Hutchins/MFMHS).

Chamber 92-0866 is 22.5 long and 5.8 centimetres in diameter (Fig. 4.26). The bore is 3.5 centimetres diameter and 19.5 cm deep, for a volume of 188 cubic centimetres. Only a portion of the base of the handle remains attached to the body. At the base of the breech, there is not a tongue proper, but the body does slant rearward at the bottom, opposite the touch-hole, which would help to keep the chamber caught under the wedge so it would not escape during firing.



Figure 4.27. Verso breech chamber 1163 side and top views. (Photo: Cameron Hutchins/MFMHS).

Breech chamber 92-1163 is 20.6 centimetres long and 7cm in diameter (Fig. 4.27). It has a bore of 3.5 centimetres diameter and 17 deep, with a volume of 164 cubic centimetres. The lower half of the handle has survived. No marks or tongue are seen on this piece.



Figure 4.28. Verso breech chamber 2109 side and top views. (Photo: Cameron Hutchins/MFMHS; Drawing Robert Cummings/MFMHS).

Breech 96-2109 has a length of 22.8 centimetres and a diameter of 7.8 centimetres. The bore is 4.5 centimetres dia. and 18.6 centimetres deep, giving a volume of 294 cubic centimetres. This breech has a

diamond-shaped recess around the touch-hole, and just forward of this an 8-pointed star is chiselled into the body. A remnant tongue is at the base of the breech opposite the touch-hole. There is a pronounced weld-scar running the length of this breech, clearly revealing that the body was built of a single, thick lap-welded planchet.



Figure 4.29. (L) Verso breech chamber 95-1842 side and top views. (R) Detail of touch-hole and recess (Photo: Cameron Hutchins/MFMHS)

Breech chamber 95-1842 is a well-preserved example, with an intact handle, remnant of a tongue, and well-defined touch-hole recess. The breech chamber is 22.7 centimetres long and 7.7 centimetres diameter. The bore is 3.5 centimetres diameter and 20 centimetres deep, with a volume of 192.5 cubic centimetres.



Figure 4.30. Breech 97-2552 side and top views. (Photo: Cameron Hutchins/MFMHS).

Breech 97-2552 is virtually identical to 95-1842 (Fig. 4.30). It is also well-preserved, and it has an intact handle and a tongue at the base, opposite the touch-hole. The breech chamber is 22.7 centimetres long and 7.7 centimetres diameter. The bore is 3.5 centimetres diameter and 20 centimetres deep, with a volume of 192.5 cubic centimetres.

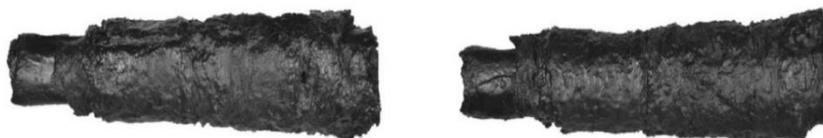


Figure 4.31. Breech chamber 96-2223, top and side views. (Photo: Cameron Hutchins/MFMHS).

Another Chamber, 96-2223, is quite a bit larger than any of the other verso breech chambers, and is of a different construction, too (Fig. 4.31). This piece is 37 centimetres long and 12 centimetres in diameter at the base of a conical body. It has a 4 centimetres diameter bore that is 31.8 centimetres deep, creating a volume of 399.2 cubic centimetres. The chamber is “built up” in that it is constructed of a single, lap-welded planchet of iron, formed to create the bore. Forged over this cylinder are four wrought-iron bands to reinforce the structure. The band nearest the muzzle of the breech has corroded to reveal the better-preserved inner cylinder. No handle has survived, nor has a tongue. There is no verso found on the St. Johns site that would accommodate a breech chamber of this size, and there is the possibility that it was intended for a larger tube-gun.

None of the St. Johns verso breech chambers were loaded, but two examples were found on the Molasses Reef wreck, their mouths were sealed with wooden plugs and the chambers contained a granular black substance, presumably gunpowder (Keith, 1987:199); an indicator that, for ships that carried versos, at least some chambers were pre-loaded and kept at the ready.

Wedges



Figure 4.32. Iron Wedges from the St. Johns wreck; smallest (L) to largest (R). (Photo: Cameron Hutchins/MFMHS).

Multiple iron wedges were recovered from the St. Johns shipwreck site (Fig.4.32). These wedges were intended to be driven through the slots at the rear of the versos' chamber receivers, behind the breech chambers, locking the charges in place for firing. Much like the guns and the breech chambers, these wedges vary in size and design. Most of the wedges have eyes pierced just below the head, presumably to fasten a lanyard of some sort through. One wedge (97-2562a) goes a step beyond this scheme and has an iron ring that passes through the eye for, again, most likely a lanyard. There is no evidence that the other wedges originally had such rings, nor is it clear why the one example does. There is one

documented example of a similarly-ringed verso wedge, and it was found on the mid sixteenth century *Ines de Soto* site off north-western Cuba (García del Piño, 1998: 189).

The smallest of the wedges (92-0975a) is 24.2 centimetres long, 4.2 centimetres wide at the head, and 1.1 cm at the tip. It is made from a bar 1.2 centimetres thick. Another small wedge (92-0716) has been struck so frequently that the head has been flattened so much that it has obliterated over half of the eye. Two of the smaller wedges are broken so that only the tip ends remain; no heads.

Three wedges are much larger than the others, and they appear to have been for use in very large versos that have not been encountered on the site, or they were intended for use with the large iron tube guns. One of the large wedges (92-NT) has an arc-shape and has also been struck repeatedly on one end, resulting in a mushroomed end. Interestingly, this relatively narrow end does not have an eye, indicating that it might be the tip, probably struck with a hammer to knock it loose for removal after use. The other, wider, head-end is broken away, and the piece is incomplete. This large wedge is 33.5 centimetres long and 7.5 at the widest point; it is 4.2 centimetres thick. Another, large wedge (96-2030) is 8.6 wide at the head, and 5.6 centimetres wide at the point where the tip is broken. This wedge is 4.4 centimetres thick.

A verso assembled and ready for firing was recovered from the Molasses Reef wreck, and the verso wedge was to be driven with the convex face toward the chamber, which allowed the maximum force to hold it tightly in place for firing (Keith, 1987:200). Olds (1976:79) notes the same positioning was true for an example from a loaded verso from a 1554 fleet shipwreck. Large iron wedges have been found in position on tube guns still mounted in wooden carriages with the wedges oriented similarly (Howard, 1986). In counterpoint to this trend, though, a fully-assembled verso from the *Ines de Soto* site had the wedge placed with its concave side toward the breech chamber (García del Piño, 1998: 189).

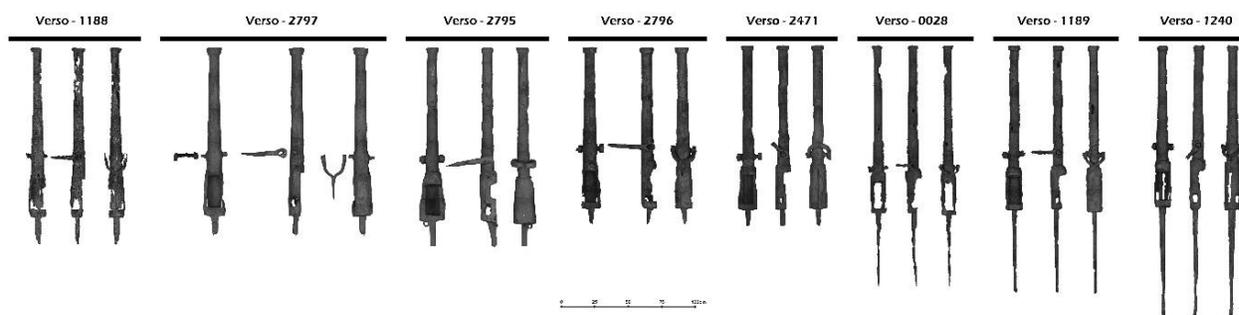


Figure 4.33. The eight complete versos recovered from the St. Johns wreck, scaled to show their relative proportions. (Photo: Cameron Hutchins/MFMHS).

A look at the versos from the St. Johns Bahamas wreck, and all of their various components, reveals much about how these wrought-iron guns were designed and operated. There appear to be two general types of verso in the collection, the *verso normal*, and the sleekly-designed *verso liso*, and what might be a sub-type of a *verso liso*.

There are stylistic differences amongst the collection, but not a tremendous amount of difference in size. The versos of the *normal* style have slightly different proportions, but they have bore diameters that range between 3.8 and 4.6 centimetres, with some of the variation attributable to corrosion.

A greater difference in both design and size is seen with the two *versos liso* found on the site. Unlike the *versos normal*, these guns have barrels and chamber receivers built of a single piece of iron. They also have considerably larger bores, at 5.5 and 5.9 centimetres. A “hybrid” version of verso that combines the one-piece construction of the *verso liso* with an added reinforcing plate where the barrel and chamber receiver come together, has a bore diameter of 4.8 centimetres.

One interesting pattern in this group is that 5 of the 8 tillers are broken, and all at nearly the same length. With one possible exception, none of these missing pieces has been found. Was this an inherent weak point in the design of the gun, or was there some purposeful breaking or cutting of the tillers?

Artillery Accessories

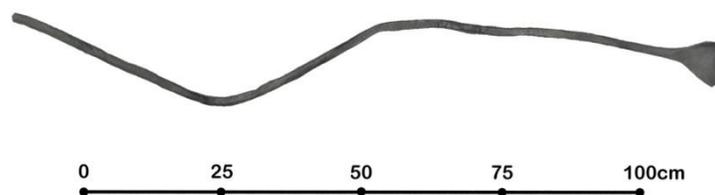


Figure 4.34. A long, spoon-like, iron implement, possibly a cannon bore-cleaning device. (Photo: Cameron Hutchins/MFMHS).

Two spoon-like, iron objects from the shipwreck appear to relate to the large tube guns in some way, as they were both found near the guns. One is a long iron rod of 1.5 centimetres diameter, with a flattened and slightly curved flare at the end (Fig. 4.34). The flare is 7 centimetres at the widest, with some wear and corrosion of its end. The overall length of this piece is 135 centimetres, though it appears to be broken at the far end and incomplete. Another similarly-broken piece is of the same diameter rod, with a comparable, but slightly-narrower, spoon-like end. Both pieces are irregularly bent, apparently from

the shipwreck process. A nearly-identical piece was recovered from one of the 1554 fleet shipwrecks at Padre Island, Texas, and it, too, appears to be broken and incomplete. The 1554 piece was tentatively-identified as being a lead-processing implement (Olds, 1976: 53).

Large Shot

A large collection of shot for use in the artillery pieces has also been found at the St. Johns wreck, and this group of projectiles is quite varied. For the large, tube-guns, we see three types: cast-iron, stone, and iron-cored lead shot. For the versos, there is a smaller lead-over-iron type, as well as simple cast-iron balls. Much smaller solid-lead balls and pellets could have been used in any of the guns.



Figure 4.35. St. Johns Large Shot: (L to R) Lead w/ Iron Cube, Sm. Cast Iron, Med. Cast Iron, Lead over Iron Cube, Lg. Cast Iron, and Stone. (Photo: Dylan Kibler/MFMHS).

As is seen in both the historical and archaeological records, stone, lead, and iron were standard materials for artillery shot of the early-to-mid sixteenth-century, and each substance was chosen for the particular characteristics it gave the shot. Cristobal de Espinosa wrote of the purposes of these different types, and he outlined the terminology used to describe them. As he described:

“There are many classes of balls: lead, stone, and cast iron. The shot of cast iron: it must be well skimmed and melted before pouring it into the mould, to have perfect hardness and to be solid. This type of shot serves to knock down walls and to set fortifications and storehouses to the ground. It must neither have voids, nor be fragile. Some shot leave without skimming or melting, which are full of charcoal, with voids, are fragile, and do not have the weight that corresponds to them for their diameter. The projectiles fired by the bombards, at the beginnings of artillery, received the names of “pallas de hierro” [balls of iron] or “pelotas” [balls] (Espinosa, 1584: f.35-35V).

The lead balls: They do not serve to knock down walls, because the lead is soft and gets pasted [onto the target]; nevertheless, they serve against gabions [rock-filled baskets], lumber, and movable earthworks (Espinosa, 1584: f.36). Lead balls from one pound, up to four or five, can be shot (Espinosa, 1584: f.43V).

The stone ball: It must be of good stone; hard, strong, solid, and [of] *marmorina* [marble?]. It serves against people and can make harm and damage. If they throw themselves some length, they break on the way or upon having gone out of the piece (Espinosa, 1584: f.36). It has been noted that stone balls for early, wrought-iron artillery were called *bolaños* (Arantegui, 1891: 409).

Lead ball with iron dice: It is somewhat better than that of stone and that of lead because it penetrates more. It received the name of *bodoque*; the amount of iron was 1/6 to 1/3 the weight of the projectile, and it was used to fire from the *cerbatana*, the *ribadoquín*, and the *falconete* (Espinosa, 1584: f.36V)."

Other shipwrecks of the era are seen to have carried similar sorts of shot. The Ines de Soto site off northern Cuba had large cast iron shot, and lead/iron composite shot of both the large and small varieties (García del Piño, 1998:194). The Emmanuel Point I ship, a vessel associated with an attempted settlement of Florida in 1559, had a single large iron shot of 6.23 cm, large stone shot from 10.03 – 11.02 cm, and smaller, lead/iron composite shot of ca. 4 centimetres diameter (Smith, et al, 1995: 107-109). A single stone shot was recovered by salvagers from the Molasses Reef Wreck, and its size is not known. Other Molasses Reef shot were cast-iron shot of two general sizes (7.7 centimetres and 6.0 centimetres), lead/iron composite shot (4.0 centimetres average), wrought-iron shot, iron "langrage" roughly cut from bar stock, and hollow, cast-iron grenades (Keith, 1987: 218-227). Stone shot ranging from 9.9 to 12.6 centimetres have been recovered from the 1554 sites at Padre Island, Texas, as have wrought-iron, cast-iron, lead/iron composite shot, and solid lead balls (Olds, 1976:85-86; Arnold & Weddle, 1978: 250-252). In examples from both the 1554 fleet and the *Mary Rose*, shot was found loaded in barrels with hemp wadding surrounding the ball, to help seal against windage (Arnold and Weddle, 1978: 250; McKee, 1982:83).

Two types of markings are cast into a small number of the iron shot (Fig. 4.36). One is a cryptic character that could be interpreted as a "p" or a "d," depending on its orientation. This same mark with slight variations has been seen on shot recovered from the Spanish vessels *El Gran Grifon* and *Santa Maria de La Rosa*, both wrecked in the Armada campaign against England 1588 (Martin, 1972). A single example of the other mark, a simple capital "B," is also seen. These are perhaps foundry marks, though that has not been determined with certainty.



Figure 4.36. Unidentified marks found on cast into St. Johns iron shot. (Drawings: Robert Cummings/MFMHS).

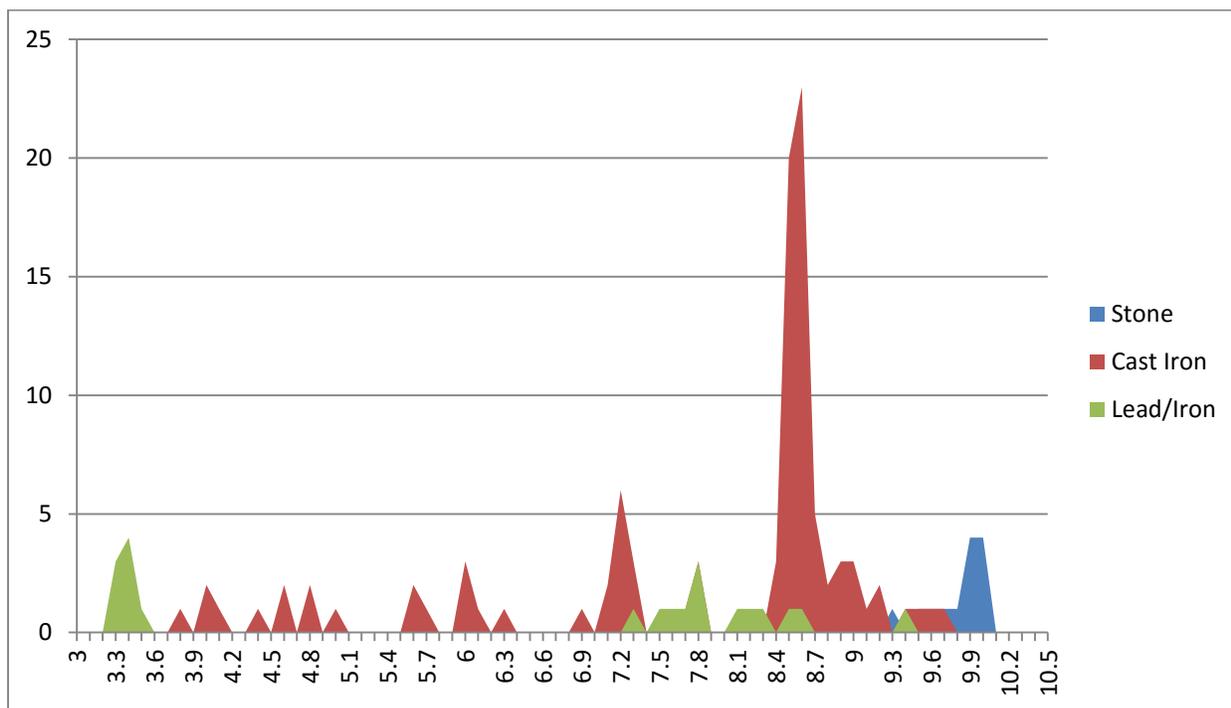


Figure 4.37: Large Artillery shot from the St. Johns wreck graphed by number of examples for each diameter.

The St. Johns large shot range in diameter from 3.2 cm to 10 cm, and when they are graphed by the number of pieces for each diameter, each material type is found to cluster according to size. When these groupings are compared to the bore diameters of the various guns, a correlation is seen linking classes of shot with particular guns. This relationship appears to explain why some of the shipwreck’s artillery pieces, especially the large tube guns, are proportioned as they are.

Small Shot



Figure 4.38. Small Lead Shot, with 3.4 centimetre iron-cored lead shot (L) for scale. (Photo: Dylan Kibler/MFMHS).

In addition to the large shot, dozens of examples of small, solid-lead shot were recovered from the site. Many are balls that range in size from 1.4 centimetres to 0.375 centimetres. Others are irregularly-cut, cube-like “dice” that are approximately 0.5 centimetres to a side. These smaller shot were found scattered loose throughout the site. All of these lead pieces could have been used as groups of scatter-shot pellets in either the tube guns or the versos. Some of the round shot were, as will be seen later, for use by shoulder-mounted harquebuses.

Wrought-iron Artillery from Spanish Indies Shipwrecks

Wrought-iron guns were carried from the earliest days of European contact with the Americas. Christopher Columbus mentions having “lombards” in his account of his first voyage in 1492 (Fuson, 1987:154). Fragments of wrought tube-guns and a verso have been found at La Isabela, a European settlement established on the north coast of Hispaniola in 1493, during Columbus’ second voyage to the New World (Deagan and Cruxent, 2002:231-232). There are ten other sixteenth-century Indies shipwreck sites reported in the archaeological literature; almost all these ships were armed with combinations of breech-loading tube guns and versos.

| Artillery from Other Sixteenth-Century Shipwrecks in the Americas | | | |
|---|---|--|---|
| Date | Wreck Site | Guns | Source |
| Early Sixteenth Century | Highbourne Cay, Bahamas | 13 Versos Two Tube Guns | Smith, Keith, & Lakey, 1985; Peterson, 1974 |
| Early Sixteenth Century | Bahia Mujeres, Mexico | One Falconete 1 Verso 1 Tube Gun | Keith & Smith, 1984 |
| Early Sixteenth Century | Pre-site One, Saona, Dominican Republic | 4 Versos 1 Tube Gun | Turner, 1994 |
| Early Sixteenth Century | Pre-site Two, Saona, Dominican Republic | 8 Versos 1 Tube Gun | Turner, 1994 |
| Early Sixteenth Century | Caballo Blanco, Saona, Dominican Republic | 4 Versos 2 Tube Guns | Turner, 1994 |
| Ca. 1513 | Molasses Reef, Turks & Caicos Islands | 16 Versos 3 Tube Guns | Keith, 1987 |
| Early Sixteenth Century? | Playa Damas, Panama | 18 (?) Versos 5(?) Tube Guns | Castro, 2005 |
| 1554 | Padre Island, Texas (Two Sites) | 7 Versos 6 Tube Guns | Arnold & Weddle, 1978 Olds, 1976 |
| Ca. 1556 | Ines de Soto Reef, Cuba | 5 Versos 1 Tube Gun | López, 1995, García del Piño, 1998 |
| Post-1577 | Western Ledge Reef, Bermuda | 2 Versos 2 Cast Iron Cannon | Watts, 1993 |

Table 4.2: Types and numbers of guns from sixteenth-century Spanish Indies shipwrecks.

This data shows that the St. Johns artillery, with its nearly 3:1 ratio of versos to tube guns, is well in-line with that from other colonial ships of the period (Table 4.2). Interestingly, if the guns found on these Indies shipwrecks are representative of what was originally put on board, then none of the vessels were sailing in compliance with the royal ordinances. It might be that some of the wrecked ships carried bronze guns, which were preferentially salvaged in antiquity, but there is no archaeological evidence – no muzzle-loader hardware or carriage parts – to support their presence. Based on this sampling of shipwrecked artillery, wrought-iron versos and tube guns were a standard part of, if not the standard for, Spanish colonial shipboard artillery during the first three quarters of the sixteenth-century.

Elsewhere, the *Museo del Ejercito* (MDE) in Madrid, Spain, houses a large and diverse collection of wrought-iron tube guns, perhaps the largest in the world, and these pieces certainly characterize at least some of the large wrought-iron artillery used by Spaniards in the fifteenth and sixteenth centuries

(Bermúdez de Castro, 1956). By graphing each tube gun barrel by its length and bore and grouping them according to the names assigned to them by the MDE, an idea is found of how what these various guns are classified and what sizes of guns the names actually represent. The groupings reinforce and help to illustrate the classifications for wrought-iron artillery devised by Vigón, and they ultimately reveal how the St. Johns guns compare to others. Along the peripheries of some of the groups are guns that are proportionally similar but yet fall into different classifications, showing a bit of arbitrariness to the taxonomies.

When the St. Johns gun tubes are compared to those from other in the MDE collection, we see that one shipwreck's guns is very nearly average-sized, but the other two are longer and of smaller bore than most in the MDE group (Fig. 4.39). The shortest of the St. Johns guns could be classified as a *bombarda* or *bombardeta*, the intermediate as a *bombardeta*, and the longest, because of its proportions, might be classified as an exceptionally large example of a *cerbatana*.

When the MDE gun tubes are compared to those from all sixteenth-century Spanish shipwreck sites found in the Indies, this same trend continues: In general, longer, sleeker guns were used on ships sailing in the Americas (Fig. 4.40). The guns found in the Caribbean region were all ship's guns, and the guns found in the *Museo del Ejercito* were presumably survivors of land campaigns (*ejercito* = army). Though their exact pedigree is generally uncertain, the MDE guns, many with bore diameters from two to three times greater than the Caribbean examples, more likely used their large shot to pound heavy fortifications.

Considering all of the Caribbean guns were recovered from shipwrecks and were once used as shipboard artillery, there appears to be a trend for maritime armament: Guns used on-board ships were longer and thinner than those used on land. Biringuccio hints at why: "...others are made which are slimmer and of a greater range and with which not iron but stone balls are discharged. These are not good for breaching walls and serve only for shooting at infantry or cavalry and at armed ships at sea" (1540 [1990]:225). He was describing bronze breech-loading guns, but his observation appears to apply in some way to the wrought-iron guns found on shipwrecks.

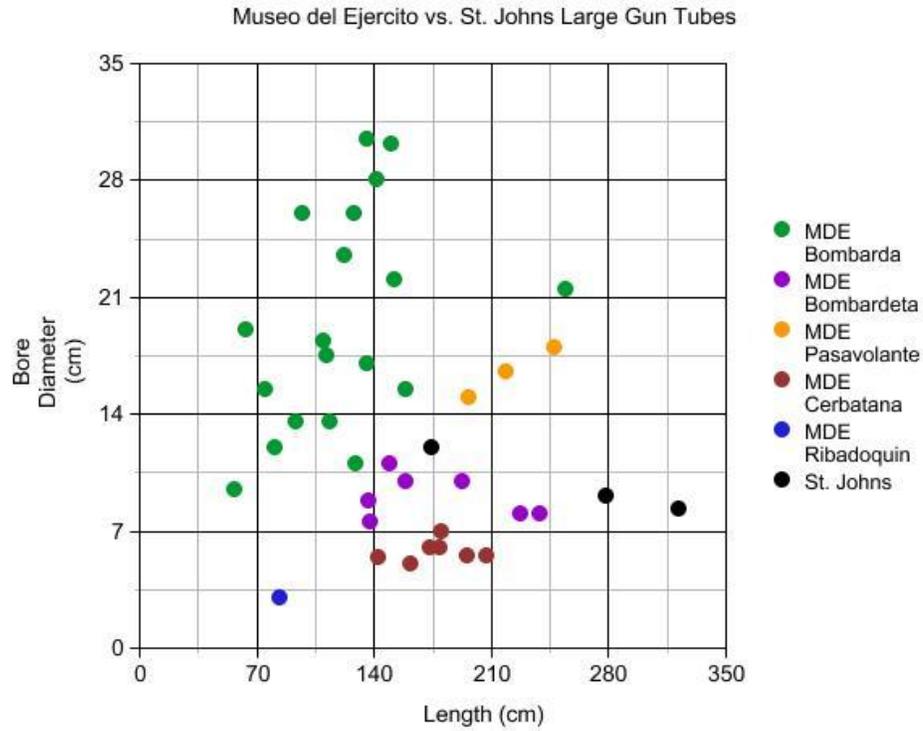


Figure 4.39: Bore-to-length ratios of the various types of wrought-iron tube guns in the *Museo del Ejercito*, Toldeo, compared to those from the St. Johns Bahamas wreck.

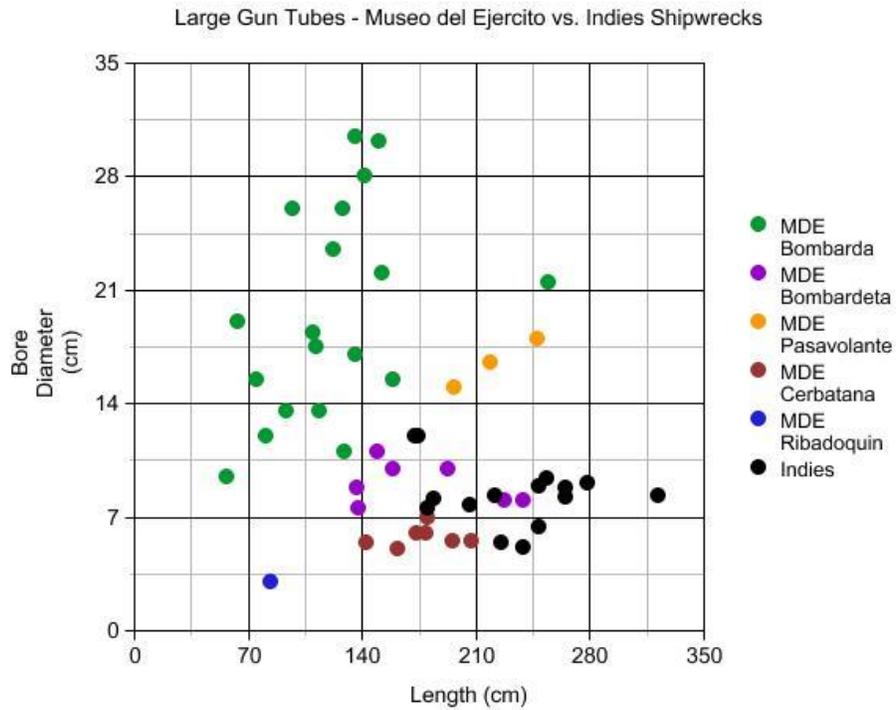


Figure 4.40: Bore-to-length ratios of the various types of wrought-iron tube guns in the Museo del Ejercito, Toldeo, compared to those from Spanish Indies shipwrecks.

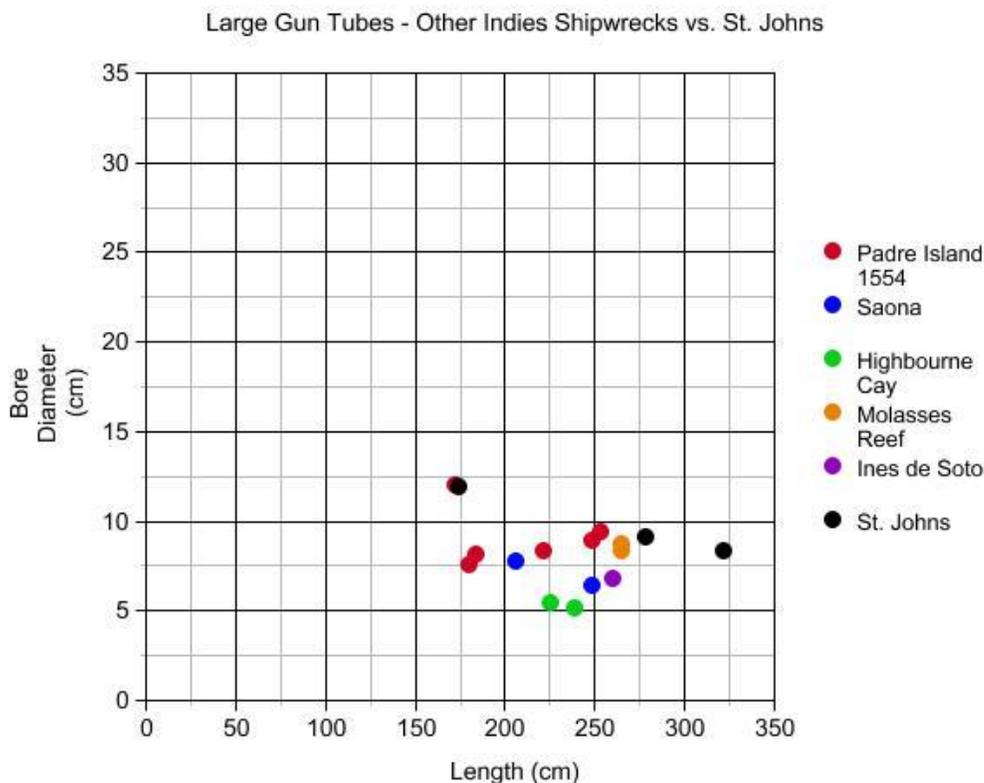


Figure 4.41: Bore-to-length relationships of the various types of wrought-iron tube guns from other Spanish Indies shipwrecks, compared to those from the St. Johns Bahamas wreck.

Even when the guns of the St. Johns wreck are compared to those from other sites in the Americas, they are still longer than average. The shortest gun from the St. Johns site, with one of the lowest bore/length ratios, and nearly identical to a gun from the 1554 fleet, is the exception. The other two barrels from the SJBW are the two longest seen in this survey (Fig. 4.41).

The Ballistics of the St. Johns Tube Guns

As has been noted, the three large, wrought-iron gun tubes from the St. Johns wreck are each of a significantly different size and proportions: One is short and squat, with a length of 174.2 centimetres and a bore of 12 centimetres, measuring proportionally at 14.52 calibres; another is intermediate; 279 centimetres with a bore of 9.1 centimetres, and proportioned at 30.66 calibres; the third is the longest and most slender, at 322 centimetres long, a bore of 8.3 centimetres, and proportioned at 38.8 calibres. These differences naturally lead to questions about their significance and why they might be: Was this simply a hodgepodge collection in which any old gun was used, or is there a purpose and scheme behind the varying sizes? It was initially thought, based purely on speculation, that the shortest gun was likely

intended for blasts of heavy shot to be fired at close-range with less accuracy, the longest was for greatest range and accuracy, and the middle gun performed somewhere in-between. This is probably not the case, though, and research by military historian John Guilmartin (1988, 2004) into black powder ballistics reveals what is a more likely reason behind the differences.

According to Guilmartin, there has been a common misperception that the range of sixteenth-century guns was positively correlated to their barrel length. This is for two reasons: many artillerists of the period believed it themselves, and the principle is true of modern smokeless gun powders (2004:295). Black powder, though, behaves differently than more recently developed powders, and, because it is what was used in ancient artillery, its properties must be considered in an analysis of their performance. Shot are driven by the pressure on them exerted by explosive decomposition of the charge, and muzzle velocity is proportionate to the pressure exerted on the shot, multiplied by the time the pressure is exerted (2004:301). Black powder does not burn efficiently - the molecular weights of the decomposition products are high; only 44% are propellant gasses, with the remainder being solid residues, and its burning rate is independent of pressure and temperature (1988:48). This limits the maximum achievable velocity with black powder to ca. 1800 feet/second (2004:297), and for shot, this upper limit is attained at a certain distance from the face of the explosion. This is because the shot accelerates through the barrel only as long as the charge continues to evolve expanding, pressurized gases at a rate greater than the ball is already moving. A point is reached where the shot has accelerated so that it is expanding the volume behind it faster than the black powder can decompose and maintain an increasing pressure; just before that point is the optimum barrel length for maximum muzzle velocity. Guilmartin has determined that the point of maximum muzzle velocity in black powder artillery is 8 to 10 feet (2.44 -3.05 meters) (2004:302). If the barrel is any longer, the shot will actually lose momentum before being expelled, and velocity and range will be reduced (2004:301).

Significantly, for an understanding of the St. Johns artillery, this optimal distance is calculated for iron shot. Guilmartin speculated further about stone shot, which, having less mass, would accelerate more quickly for the same internal pressure and would require a shorter barrel to reach its greatest velocity (*ibid.*). Conversely, then, it should be that lead shot, with its greater density and mass, would accelerate more slowly and require a longer barrel length to achieve maximum muzzle velocity with black powder.

When looking at the three tube gun barrels from the St. Johns wreck this idea of optimal length is compelling, and when looking at how the various types of shot correlate to the barrels, it becomes apparent that the differences in barrel design were likely purposeful and linked to the concept. The

barrel with smallest bore – 8.3 centimetres – is also the longest; the second-longest has a bore of 9.1 centimetres; and the shortest barrel has a bore of 12 centimetres. The average large lead-over-iron composite shot is 8.04 centimetres diameter; of the cast-iron shot over 6 centimetres (the size too large for the versos), the average is 8.22 centimetres diameter (with 67% ranging between 8.4 and 9.1 centimetres); the average stone shot is 9.74 centimetres in diameter. In all of these measures, there is a correlation between shot material-type and barrel length: All of the stone shot could have been fired only from the shortest gun (99-2798); the majority of cast-iron shot would have best fit the medium-length barrel (92-1186); and the majority of the lead/iron composite shot would have best fit the longest of the gun tubes (92-1187). These correlations fit with Guilmartin’s findings about black powder and maximum bore pressure, and so it appears that the St. Johns tube guns constitute a purposeful suite, with each piece designed for optimal performance with a corresponding shot type.



Figure 4.42. The relative proportions of the three St. Johns wreck tube-gun barrels. (Photo: Cameron Hutchins/MFMHS).

And the same concept of maximum bore pressure appears to have applied to shipboard, wrought-iron tube-guns, generally (or at least those in the Indies). The known tube-gun barrels recovered from early

Indies shipwrecks have an average length near 250 centimetres – very near the dimension at which the pressure is optimised for iron shot. For ships under sail, this allowed them to utilize peak shot velocity and fire at the greatest range, important qualities when engaging an enemy in the open expanse of the sea.

What can be said about the St. Johns artillery?

The St. Johns wreck was well-equipped with a large number of wrought-iron guns of varying style and design. Three large tube-guns vary in proportion, with each size apparently linked to a type of shot: a short, stout gun most effectively fired stone *bolaños*, which would blast fragments at enemy personnel; an intermediate for iron shot *pelotas*; a slender barrel for lead/iron composite shot called *bodoques*, designed for greater penetration of, most likely, ships' hulls. Each gun was designed to deliver its corresponding shot type at maximum velocity and range, increasing the ability of the ship to defend itself.

Rail-mounted iron versos also varied in size and design, but the reasons for the differences are not as clear. Most of the versos were of a “normal” style in which the barrel and breech receiver were separate pieces forged together, and though they were of varying size and design, all had similar bore diameters. Three versos had barrels and breech receivers that were built of single pieces of iron, and which then had tillers attached; two of these “smooth” versos, though they were no longer than their counterparts, all had bores that were larger than the others; two significantly more so. Fragmentary pieces of versos hint that there might have been even more guns carried by the ship, though at least one piece looks to have come from a gun that was damaged and broken before the shipwreck and was simply put in storage alongside the other artillery.

Some of the shot recovered from the wreck was of a size that it could have only been used for these rail guns. Lead balls formed over smaller iron cubes, roughly 3.5 centimetres diameter, and which were intended for use in such artillery. Many of the recovered cast iron shot would have been too small for the large tube guns, but would have been appropriate for the larger-bored versos. The use of cast-iron shot in versos is documented by a cast iron ball found in the bore of a verso from a 1554 ship (Olds, 1976:86). Other, smaller, solid-lead shot and pellets could have been fired as scatter-shot from any of the artillery pieces.

Approximately 12 large breech chambers for tube guns have been seen on the site, indicating there were at least four for each barrel. At least one of these large chambers was loaded and ready to fire.

There are eight breech chambers for the versos that have been recovered, and there were undoubtedly more – at least two remain on site, seen in unexcavated areas of the shipwreck, but not recovered.

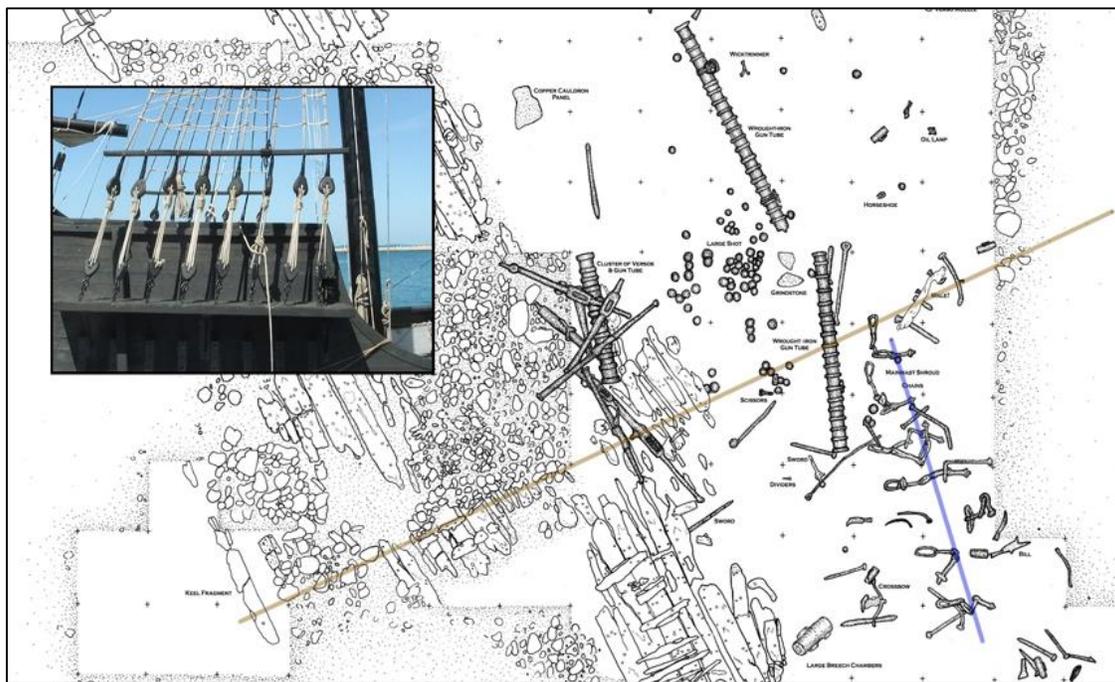


Figure 4.43. The location of the St. Johns artillery relative to the shroud chains (blue line) and the hypothetical position of the mainmast (brown line). Inset: Starboard shroud chains relative to the mainmast of the replica Spanish nao *Victoria*, 2014.

As is seen in the historical record, many Indies ship's crews had a bad habit of stowing their artillery below deck while at sea, and it looks as if this was the situation on the St. Johns ship. The first indicator that the ship's artillery was stowed is that the long tube guns are aligned with, or very nearly to, the longitudinal line of the ship: If the guns had been deployed at the time of the ship's sinking, they would be perpendicular to the length of the ship. Secondly, the arrangement of the artillery looks to have been done so purposefully and carefully, with the guns and shot arranged to distribute their weight across the width of the ship to balance the load. Two large tubes are set to one side of the vessel, and a single tube with a group of seven versos are set to the other side; in between the two groups of guns are many large shot, perhaps once stored in a box or some other container. Judging from the position and alignment of the nearby mainmast shroud chains, the guns were stowed below deck, around or just forward of the mainmast. This placement would have made them readily accessible through the main hatch on the weather deck, just forward of the mast (Fig. 4.43).

There is also purposeful placement of the large breech chambers that can be seen from the site plan. These powder charges were stowed well abaft of the guns, some 5 – 12 meters behind, near the ship's

stern. Interestingly, these powder charges are far from the galley (most clearly evidenced by the remains of a copper cauldron) found well northward, and towards the bow, indicating the potentially explosive devices were kept well-away from where there would have been a regularly-lit flame.

From all the archaeological evidence, it appears that all the artillery the St. Johns wreck carried were wrought-iron, breech-loading guns; no accompanying muzzle-loader hardware such as worms, powder-scoops, sponges, or rammers are found on the site, nor is there any indication of carriages or their hardware. And there is no evidence seen from the shipwreck for gun ports: There are no openings or frameworks found in the remaining hull structure, and there were no hinges for closable lids. It may well be that the ship did not need to utilize a gun deck. A sixteenth-century treatise on the design, outfitting, and organization of ships states expressly that breech-loading artillery should not be used below decks: “Note that all the open pieces that are served with chambers (breech-loaders) have to be on the weather-deck, because if they are below, the smoke that stays inside blocks the view of those who are using them, so they and the versos have to be put on the castles of the stern and the bow and entrusted to the lesser-skilled gunners...” (García de Palacio, 1587 [1993]:118).

Crew lists are found for three galleons in an Indies voyage of 1562-63 under the command of Pedro Menéndez de Avilés. Each of the ships carried eight “lombarderos,” or gunners, with one of the men in each group serving as “condestable,” or sergeant (Anonymous, 1563: F41R-42R; F56V-59V). If this same scenario applies to the St. Johns ship, and it, too, had a similar number of *lombarderos*, there would have been more guns than gunners, and unskilled assistance, whether from crew or passengers, would have been essential to operating all of the guns at once.

Documented artillery and weapons of early Spanish Ships

Lists of artillery and arms aboard Spanish Indies ships of the sixteenth century show an evolution of preferred weaponry through time. The trends show a peak use of wrought-iron artillery in the early-to-mid sixteenth century, with a fall-off in favour of bronze guns. Some “typical” examples of shipboard ordnance are as follows: In 1513, a fleet bound for Tierra Firme carried four bronze *ribadoquines*, two bronze falconets, 35 bronze arquebuses, weapons for cutting, 200 bronze *espingardas* with their dressing of short lances, 400 cork bucklers, 200 wooden shields, 800 helmets, 300 swords, 800 linen doublets, 200 daggers with their scabbards, 200 *vitorianos* with scabbards, 50 crossbows, 600 dozen arrows for crossbowmen, and 200 pikes, along with tin, iron, lead, powder, and supplies for preparing powder (Anonymous, 1513). In 1523, the 200-ton ship *Santa María Miguel* carried much wrought-iron

artillery: 8 large lombards (two breech chambers each), 4 *pasamuros* and 8 *pasavolantes* with breech chambers for each, and stone shot for them. Also, 20 hand-held *escopetas* (hand-held guns, with flasks, powder, and lead), 30 crossbows with 360 bolts, 120 pikes, 120 large lances, 35 short spears, 480 arrows, 18 corslets with their armour, and 24 oblong shields (Casa de Contratación, 1523). In 1530, the ship *Santa María de la Concepción* carried four large lombards (two chambers and 12 balls each), four versos (two chambers each), ten *escopetas*, six crossbows (24 bolts each), 48 lances, 48 pikes, 72 spears, 8 corslets, 18 bucklers, and each mariner carries his own corslet, sword, and buckler (Casa de Contratación, 1530). Interestingly, the mention of iron versos on this ship is one of the earliest for this type of gun.

In 1545, the 250-ton *Santa Cruz* carried four large lombards (2 chambers each), four *pasamuros* (2 chambers each), two other large pieces, 14 versos (2 chambers and 12 balls each), six hundredweight of powder, 18 crossbows (12 bolts each), 72 long pikes, 96 short spears, 19 bucklers, and each mariner brings his own sword and buckler (Casa de Contratación, 1545c). A list of items he carried on-board the galleon *San Pelayo* for the voyage to colonize Florida in the earlier part of 1565 shows “250 arquebuses, 100 helmets, 30 crossbows, 30 breastplates and small breastplates, 100 lances with their irons, 1,758 iron cannonballs, 10 pieces of bronze artillery, sent in *San Pelayo* to serve in it, which belong to Pedro Menéndez de Avilés, and all the cast-iron [sic?] artillery lombards, *pasamuros*, and versos” (Lyon, 1992: 35-36). In 1586, the 300-ton, New Spain ship *La Magdalena* carried a bronze piece of fifteen hundredweight, two bronze pieces of twelve hundredweight, four bronze falcons with their breech chambers and wedges, three pieces of cast iron, arquebuses, iron balls, 26 chain shot, 36 halberds, 36 long pikes, 12 bucklers, 12 breastplates (Casa de Contratación, 1586).

The wrought-iron artillery seen on the St. Johns wreck, though certainly very much in line with what was used in the middle of the sixteenth century, would also have been part of a fading technology by that time, as bronze guns began to supersede it. Indeed, in the second part of the 1500's, wrought-iron artillery was falling out of favour for multiple reasons. In 1560, Captain Juan Ruiz Ochoa illustrates this when he wrote to King Philip II with his ideas for improvements in the management of ships. One of his suggestions was that iron guns be replaced with bronze, because, “The iron artillery that the Indies ships carry does not help for anything, because in going to sea, they put it under the deck, and, in part, they are correct, because it [the iron artillery] is not of any effect for combat, save but when it was new and proved. Because of not being new [and] coming to the end of its fighting life, it most all explodes, and it does no harm to the enemy before it kills the people inside of the ship...” (Ruiz, 1560). Why ship-owners

outfitted their ships with increasingly obsolete, and apparently dangerous, artillery is not clear. It might have stemmed from a sureness that their vessels were unlikely to be attacked, or perhaps it was sheer miserliness.



Figure 4.44. A breech-loading, wrought-iron tube gun being fired. (Detail from Bartolomé Bermejo, *Descent of Christ into Limbo*, ca. 1475, Museu Nacional d'Art de Catalunya).

And it was not only improvements in metallurgy and gun-founding that were hastening the decline of wrought-iron artillery. New classes of weapons were being developed that were more efficient and better suited to the often crowded conditions found on a ship at sea. Captain Ruiz wrote of this, too, when he advocated for the transition from versos to newly-developed and more versatile muskets. He urged, "Your most Illustrious Lord must order all the vessels of the fleets of the Indies to take muskets of new invention...because they are of the biggest effect for fighting like the versos and are of greater facility, so that a man can carry it in the ship from stern and bow, as necessary" (ibid.).

The archaeological record shows that, in general, Ruiz's advice was apparently heeded. In the last decades of the sixteenth century, the incidence of wrought-iron guns appears to decline drastically from the numbers seen on the St. Johns wreck. For later sixteenth-century shipwrecks with known dates, the unidentified, post-1577 Western Ledge wreck at Bermuda carried only two versos (Watts, 1993). In lists of artillery placed on-board ships of the 1588 Spanish Armada, there are only undifferentiated entries for wrought-iron guns (Thompson, 1975), and a few breech-loading wrought-iron tube guns and versos supplementing larger batteries of bronze artillery have been recovered from some of the Armada wrecks (Martin & Parker, 1988: 220-222). The latest, firmly-dated wrought-iron breech-loader from a shipboard context is a single, hooped, *falconete* swivel gun that was associated with the 1622 *Tierra Firme* fleet ships wrecked in the Florida Keys (Malcom, 1997). With that, the era of breech-loading, wrought-iron artillery on-board ships appears to have come to a close in Spain's maritime outposts.

Chapter 5: HARQUEBUSES

Another class of gunpowder weapon found on the St. Johns wreck is the muzzle-loading, portable firearm known as the harquebus. Harquebuses had wrought-iron barrels mounted on wooden stocks and their powder charge was ignited by a mechanism known as a matchlock. When a lever-style trigger was pulled, it dropped a clamped match of saltpetre-soaked cord into the priming pan. The priming pan held a sprinkling of gunpowder adjacent to the gun's touch-hole. When the powder in the pan ignited, its flame reached the main charge through this hole, which fired the shot. In the later part of the 1500's, the similarly-designed, but larger, musket joined the harquebus as a prevalent firearm of the early-modern period (Fig. 5.1).

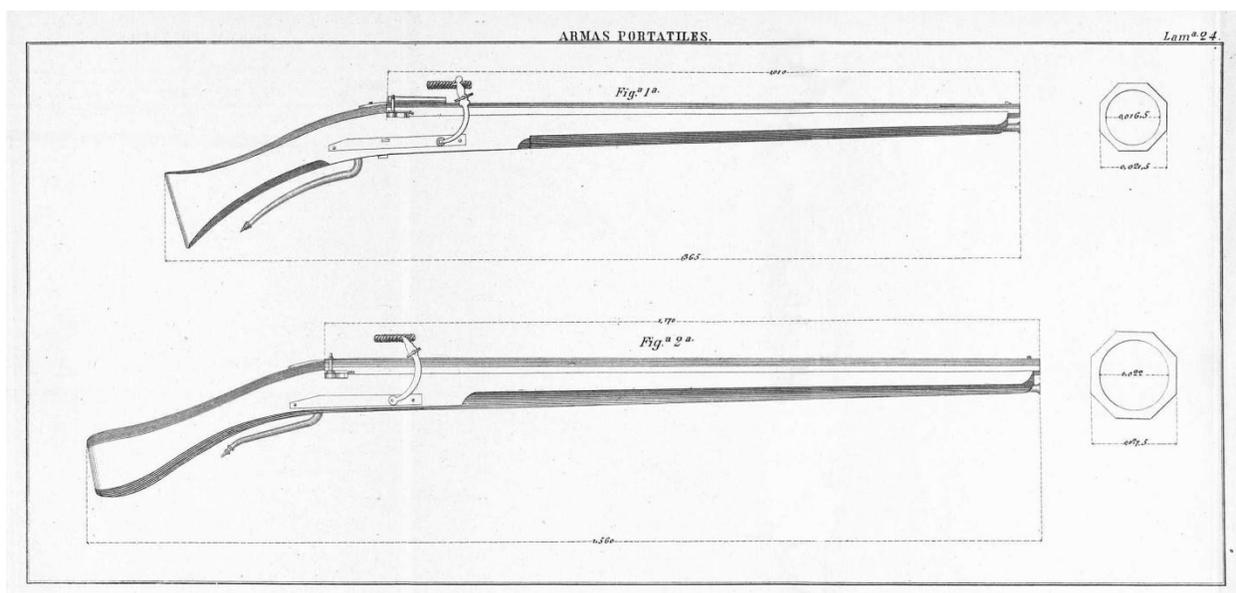


Figure 5.1. *Armas Portatiles*: Harquebus (top) and Musket (below). (Arantegui, 1887: Lamina 24).

Early Firearms

Firearms are first seen in Europe in the fourteenth century (Chase, 2003: 59; McLachlan, 2010: 13-14), and their entry into the Americas coincided with the arrival of the European explorers in the late fifteenth century. There is some confusion as to the names given to the various types of early Spanish guns; the terms *espingarda*, *hacabuche*, *escopeta*, and *arcabuz* (harquebus) were all used to describe early firearms used in the American colonies (Brown, 1980: 35-38). Though these terms are not well defined, they do appear to have described different types of portable guns. A list from 1501 shows that

hacabuches were a relatively large firearm, with an entry for a bronze *hacabuche ochavado* [octagonal] marking its weight as 39 pounds (Arantegui, 1887: 178). Based on the described size, these were likely hooked, “wall” guns; essentially hand cannons mounted on stocks and lit by a hand-held match (Fig. 5.2). In 1513, as Pedrarias Davila was preparing a voyage to Panama, his fleet was outfitted with two types of firearm - 200 *espingardas* and 35 *hacabuches* - both types “de metal” [of bronze]; the *hacabuches* each weighed 30 pounds (Ferdinand II, 1513). A nineteenth century catalogue of the Spanish Royal Armoury defines the *espingarda* as similar to an arquebus or musket, but large, at nearly 8 feet long, and which fired a lead ball weighing as much as one pound. The first incarnations of the *espingarda* were supported by a small stand, and later they rested on forks (Fernández de Córdoba, 1854: 48).



Figure 5.2. *Messinghackenbüschen*, (Anonymous, 1502: f72R).

Brown argues that there was likely a short period where the terms *hacabuche* and *arcabuz* were interchangeable (1980:36), and from the phonology of the words there does appear to be a connection. The change toward the arquebus as a distinct weapon was visibly underway, though, by the 1510's: A 1512 contract for the manufacture of firearms calls for the production of both *escopetas* and *arcabuzes* (Soler del Campo, 2006: 856), and in 1519, a Spanish fleet for Panama lead by Lope de Sosa carried 50 *espingardas* along with 15 *arcabuzes* (Carlos I, 1519).

By the 1530's and 1540's, arquebuses were being regularly employed on board Indies-bound ships. In a 1536 directive, after having heard of French and English corsairs heading into the Atlantic, the King ordered that an outbound fleet be supplied with 200 arquebuses and 200 crossbows to protect themselves (Carlos I, 1536: F.76V-77). In 1538, as Blasco Núñez Vela prepared a fleet for Tierra Firme, Queen Juana ordered that 150 arquebuses be transferred from the royal arsenal to the fleet (Juana I, 1538: F.1). And in an account from 1541, as part of the preparation of fleets for the Indies, King Carlos I requested a register of all the versos and arquebuses in the royal armoury for possible use by the ships; adding "and make them clean so they are ready for when they are needed" (Carlos I, 1541).

The growing presence of arquebuses on Indies ships also coincides with the issuance of government contracts with armourers to produce large numbers of arquebuses. Arántegui found a number of such contracts dating to the 1530's and 1540's, with some calling for as many as 10,000 and 15,000 arquebuses to be produced (Arántegui, 1891: 373-376). These agreements provide specific details about the size and design of these guns. One contract called for two sizes of barrel (both called *arcabuz*) – one of twelve pounds and one of nine pounds – with each size allowed a half-pound variance (*ibid.*). Another order from 1541, for 15,000 arquebuses, called for well-finished octagonal barrels that weighed nine pounds, were one *vara* and three *dedos* long (ca. 90 centimetres), and fired a lead ball of three-quarters of an ounce (*ibid.*). Another, later contract, from 1558, offers even greater detail about the guns, and calls for arquebuses that weighed between six and a half and seven and a half pounds; were between one *vara* and one *brazo* in length (84-168 centimetres); were reinforced at the breech, tapered toward the muzzle and octagonal the entire length. The guns had to aim truly, be test-fired twice, and be well-bored and finished, with the contract warning "if scarred within by any source, however small it may be, they will not be received" (Larrañaga, 1986).

When Spanish explorers and conquistadors brought firearms to the New World, some Native Americans were awed by their noise and smoke. When Pedro de Candia, one of the first Spaniards to explore the Peruvian coast in 1528, arrived at the city of Tumbes, the Natives there had already heard from others

about his *harquebuses*. They asked him to fire one, and when he did they reacted with combined fear and delight. After the noisy demonstration, the Native leader was so impressed that he poured liquor down the gun's barrel so Candia could partake of a ceremonial drink (Cieza de Leon, 1553 [1998]:112). Despite their power to amaze, firearms look to have played only a limited role in the overthrow of the Native American empires: guns like *harquebuses* were simply too unwieldy and fickle for the requisite long marches through difficult terrain and harsh climates experienced by the conquistadors (Restall, 2003: 143). There were instances, though, where the firearms were used for the violent control and subjugation of the Native Americans, and one near-contemporary image shows *harquebuses* being carried to force enslaved Natives to march from the interior of Venezuela to the coast (Fig. 5.3). It was not long after their introduction that Spanish firearms were adopted and used by the Native Americans in ways that must have worried the colonizers, as a royal order was sent from Spain to Peru in 1555 that no Indians were allowed to possess *harquebuses* or crossbows without special permission (Carlos I, 1555). And the *harquebus* had even lost some of its ability to frighten Native Americans, as demonstrated when the *Tierra Firme* ships arrived at Dominica in 1564, and sent men ashore with twelve *harquebuses* and two *versos* to procure water; the Spanish landing party was repulsed by the Natives, despite their firepower (García de Castro, 1564a).



Figure 5.3. Detail from “Atrocities of Petrus de Calyce against the Indians,” showing *harquebuses* used by Spanish conquistadors to cow Native Americans in a forced march in Venezuela in 1542 (DeBry, 1594).

The historical record also provides a sense of how matchlock firearms were used on-board ships in the early colonial period. One particularly relevant description comes from García de Palacio's primer on shipboard management (1587 [1993]: 333-34):

“Soldiers who are sailors, are very useful for naval battles, because when fighting, when it is expedient, they can turn to the equipment and needs of the sea. This way the captain who will be able, will be right in taking many of them; and of any quality that there are. A musket or harquebus is necessary for each one; somewhat robust and which is held against the body with arms extended, a strong morion helmet, and the Burgundian helmet with its coloured tufts, twelve charges of tinned-metal, and its bag for ball-shot and large pellets, its powder flask and priming flask [*frasquillo*], his sword, dagger and round shield, so that, coming from the hands, he attacks and defends. These muskets and harquebuses have to be well-maintained and appointed with all their gear; and they shoot the enemies by the loophole slits - and strive to shoot it certainly. And [after] discharging, he will return to load with the greatest diligence that he can, to return to his loophole and aim [again].”

Another, somewhat later, account of firearms aboard ships comes from Sir Henry Mainwaring in 1619. Mainwaring delineated the role of firearms in sea battles, and he reiterated García de Palacio's idea that there is a significant difference between the abilities of soldiers and sailors: “The artillery of the seven ships being small can do little damage to large ships, but large ships could do a great deal of harm to them. These [smaller] ships also carry land soldiers who are expected to do great execution with their arquebuses. But the large ships can so damage the upper deck with their artillery that they will not be able to use their artillery or muskets, or very little owing to the smoke, and it is 50 to 1 that they [the harquebusiers] do them no harm. Those who trust so much to a number of land soldiers in sea fights do not know how much they hinder the sailors. In sea fights musketry fire is only useful upon two occasions, if the [enemy] ship is on fire, to prevent the men from extinguishing it, and if the [base] ship has a gun shot on the water line to keep her steady without pulling her over from the outside [from the recoil of artillery fire?]” (Mainwaring, 1619 [1920]: 54).

And Mainwaring elaborated further upon the performance of soldiers vs. sailors in battle: “Sea fighting consists in two points: orders, which no one can give who does not know the technical terms, and execution, in which a sailor is better than five soldiers, for the latter can only manage their muskets, while the former can work a gun, manage the sails, and board the enemy with a decent weapon. Thus, when soldiers are on board they should be under the command of the sea captain, or they will be in the way” (ibid: 55). Certainly, though, training in the use of the harquebus was necessary if it was to be used

effectively, as Humfrey Barwick warned of these guns: “...in the hands of an ignorant person, neither apte nor willing to use the same, as of right it ought to be, it is rather hurtfull than commodious: For whoever shall take in hand to use the same weapon, must take (as it were) a delichte in the well firing thereof” (1594: 8R).

The St. Johns Harquebus Remains

The distribution of the harquebuses and shot moulds across the St. Johns site shows them to be in a fairly concentrated area, stored together in an upper part of the ship’s stern; likely under the decks and cabins of the stern castle (Fig. 5.18). When these artefacts were first encountered underwater on the site, they were so masked by time, many were not properly recognized by the excavation teams and labelled as bolts, nails, or “encrusted objects.” It was only in the laboratory, during conservation, that their true identity became evident.

Virtually all of the harquebus remains from the St. Johns wreck are epoxy-resin casts made from the calcium carbonate-based concretions that formed around the artefacts while they were underwater. The guns themselves had completely corroded, leaving virtually nothing but disintegrated corrosion compounds in the voids. The type of concretion, along with the corrosion compounds contained within, as well as fragments of remaining metal, makes it clear that all of these guns were made of iron. The guns from the St. Johns wreck are generally small, but, because of the degradation they suffered in their submersion, their original weights and complete lengths are not known.



Figure 5.4. Harquebus barrel 92-0888b. (Photo: Cameron Hutchins/MFMHS).

Barrel fragment 92-0888b is a portion of an octagonal barrel, 34.4 centimetres long (Fig. 5.4). It has a bore diameter of 1.15 centimetres, based on a tube of encrustation recovered from inside the barrel. This piece has an outside diameter of 2.15 centimetres.



Figure 5.5. Harquebus barrel 92-0888c, two views. (Photo: Cameron Hutchins/MFMHS).

Barrel Fragment 92-0888c was found very near 0888b, but it is not clear if the two pieces came from the same gun (Fig. 5.5). This octagonal section of harquebus barrel is 26 centimetres long, and it has a bore of 1.35 centimetres. It is 2.1 centimetres wide on the outside.

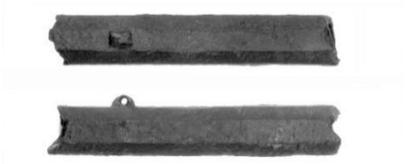


Figure 5.6. Harquebus barrel 92-1185n, side and bottom views. (Photo: Cameron Hutchins/MFMHS).

Barrel 92-1185n is a 12.1 centimetre section (Fig. 5.6). It has a bore diameter of 1.25 centimetres and is 2.1 centimetres on the outside, at the muzzle. On the underside of the barrel, 8.9 centimetres from the muzzle end, is a small looped tab. It is known from intact examples recovered from the 1622 galleons *Nuestra Señora de Atocha* and *Santa Margarita*, that such loops were used to fasten the barrel to its stock with a wooden pin.

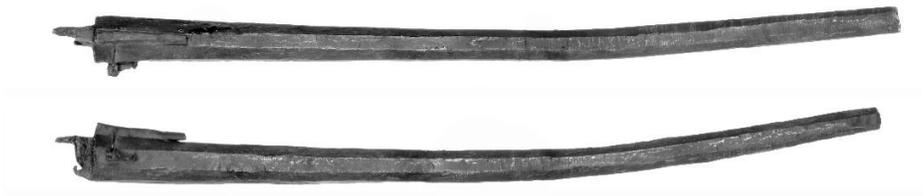


Figure 5.7. Harquebus barrel 93-1441b, top view and side view. (Photo: Cameron Hutchins/MFMHS).

Barrel 93-1441b is one of the two relatively complete examples from the site; it has a pronounced bend, likely from the shipwreck process (Fig. 5.7). The barrel is 62.7 centimetres long, and it has a tang that extends 3.1 centimetres from the breech. A 1.2 centimetres priming pan is starts at 0.4 centimetres forward of the breech. At the top of the barrel, on the breech end, is a slightly-conical, tubular match guide. The barrel is 3.6 centimetres wide at the breech end and 2.1 centimetres nearest the muzzle. Because of corrosion, the bore diameter could not be measured.



Figure 5.8. Harquebus barrel 96-2024, bottom view and side view. (Photo: Cameron Hutchins/MFMHS).

Barrel section 96-2024 is 45.5 centimetres long and octagonal in cross-section (Fig. 5.6). Its bore diameter is 1.35 centimetres, based on encrustation recovered from inside the barrel. It is 2.15 centimetres outside diameter at the muzzle. There is a small, looped tab on the underside of the barrel, 8.3 centimetres from the muzzle.

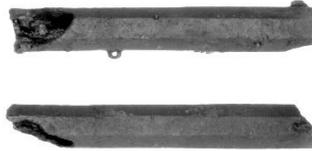


Figure 5.9. Harquebus barrel 96-0240c, side view and top view. (Photo: Cameron Hutchins/MFMHS).

Barrel 96-2040c is a fragment of 14.4 centimetres of the muzzle end (Fig. 5.9). This barrel has a small sight placed on the top of the barrel at 0.4cm from the muzzle. On the underside is a small, looped tab set 9.1 centimetres back from the muzzle end. The bore diameter is 1.2 centimetres and the outside diameter is 2.1 centimetres.

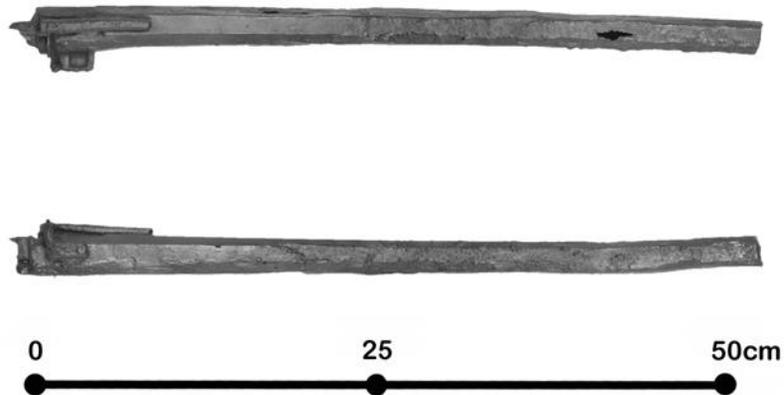


Figure 5.10. Harquebus barrel 96-2139a, top view and side view. (Photo: Cameron Hutchins/MFMHS).

Barrel 96-2139a is another relatively intact barrel with a priming pan and match guide (Fig. 5.10). The piece runs 52.7 centimeters from the tang to a point short of the muzzle. The barrel is 3.5 centimetres at the breech end and 2.5 cm diameter at the muzzle; because of corrosion, the bore could not be measured. The match-cord tube is 7.8 centimetres long, and the priming pan is 1.7 centimetres long and 1.5 centimetres wide.

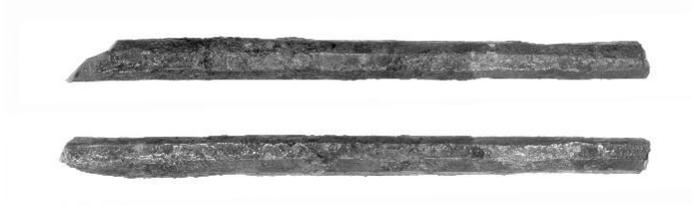


Figure 5.11. Harquebus barrel LT 1283, two views. (Photo: Cameron Hutchins/MFMHS).

Barrel LT 1283 is a section of 33.1 centimetres. It is 2.1 centimetres outside, at the muzzle (Fig. 5.11). There was no evidence of the bore remaining in the encrustation.



Figure 5.12. Harquebus Breech Plugs 96-2139-B (L) and 93-1441-A (R).

The two relatively complete barrels did have intact iron breech plugs still contained within the corrosion. These threaded plugs were all that survived of the original metal of the guns (Fig. 5.12). The plugs are 2.4 and 2.25 cm long, and the outside diameter of the threads is 1.55 centimetres; one plug has seven threads; the other, eight. These plugs were part of the larger tang, which was used to fasten the rear of the barrel to the stock. The plugs screwed into the breech of the barrel, and sealed the end. It is assumed that the harquebuses had these screwed, removable breeches to facilitate cleaning of the bore and the removal of obstructions.



Figure 5.13. Detail of breech end of barrel 96-2139a, showing match-cord guide (top) and priming pan (bottom).

There have been no firing mechanisms found on the site, but the clues provided by the recovered barrel fragments show us that they were indeed from matchlock guns. The most significant indicators for this are the tubes mounted on the tops of two barrel breeches (Fig. 5.13). These tubes functioned as holders and guides for the match-cord. The cord was fed through the tube from the breech and when it came out the forward end, it was clamped between the jaw-plates of the serpentine. When the trigger was squeezed, it levered the serpentine downward, setting the burning end of the match into the powder of the priming pan, which, through the touch-hole, ignited the gun's main charge.

Shot Moulds



Figure 5.14. St. Johns shot mould 93-1370 (top), and mould chamber of a second example, 96-2129c (bottom).

A portion of a completely corroded two iron shot moulds (93-1370 and 96-2129c) survived as resin casts made from their marine concretion. The smaller piece shows a hexagonal head 1.75 centimetres wide and 1.75 centimetres deep attached to the partial remains of hinged handles. The more intact one has a mould chamber of 1.4 centimetres diameter and 1.3 centimetres deep, and a handle 10.5 centimetres long. On both examples, the two halves of the head join with a corresponding "V" notch and protrusion, which came together to keep the mould aligned, so the shot cast from it would be consistently round. On the tops of the moulds, each half has small, semi-circular openings, that when joined with the others, form pour-holes for the molten lead. These moulds were designed to cast only one ball at a time, and the different proportions of these moulds shows they were designed to make different shot sizes. A number of lead sprues have been found on the site, indicating shot was cast on-board the ship, likely from these moulds. No evidence of other harquebus-related equipment, such as cartridges or powder flasks, has been found on the St. Johns wreck site.

Shot



Figure 5.15. Various solid lead shot from the St. Johns wreck: round, cylindrical, cubed, and flat.
(Photo: Dylan Kibler/MFMHS).

One hundred and eighty-six small, solid-lead shot have been recovered from the shipwreck site. The vast majority of these are very small pellets, ranging from 4 to 7 millimetres maximum breadth. These pellets are found mostly as round balls, but cylinders, crudely-fashioned cubes, and flat pieces apparently clipped from lead sheeting were also recovered. It is thought that these pellets were for use in any of the gunpowder weapons, large or small. Two groupings of larger round shot are seen in the collection – one cluster ranging from 10 to 11 millimetres, and another from 12 to 15 millimetres (figs. 5.16 & 5.17). The greatest number is found between 13 and 14 millimetres. Many of these round shot would appear to be intended for the ship's arquebuses. One unusual aspect of many of these lead balls though, is that they look to have been cast in two-part moulds whose halves were a bit shallower than a true hemisphere, which resulted in ellipsoid casts. These not-fully-round balls were most prevalent in the 13.5 to 14.0 millimetre examples, though some were found in other sizes. Given their relatively large size – bigger than the wreck's largest recorded arquebus bore – it looks as if these larger shot were not intended for the ship's hand-held firearms, but might have been, instead, scatter-shot for the larger artillery.

When those larger, round shot (those of 10 millimetres and greater diameter) are plotted, it is clear that the majority range from 13 millimetres to 14 millimetres diameter, though there is a smaller grouping between 10-11 millimetres diameter; numbers that correspond to the bore diameters of the recovered arquebus barrels. (Fig. 5.17). The larger shot fall between 10 and 15 grams, and there are variations in weight for a given maximum-diameter of shot. Most of these differences in weight are attributable to the fact that some shot were cast irregularly. Other examples were somehow flattened by unknown forces and have a relatively large diameter for their weight. One outlying shot has a very high weight because the casting sprue is still attached.

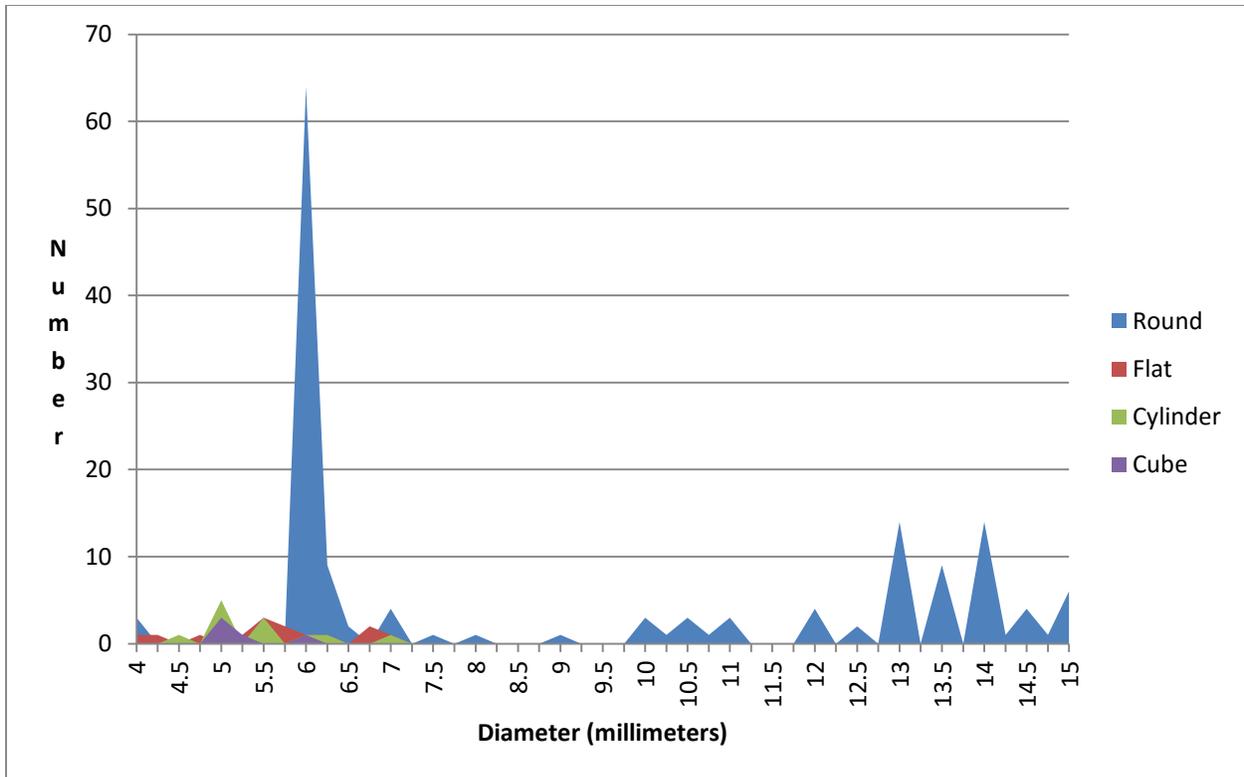


Figure 5.16. Solid lead shot from the St. Johns wreck by size and number.

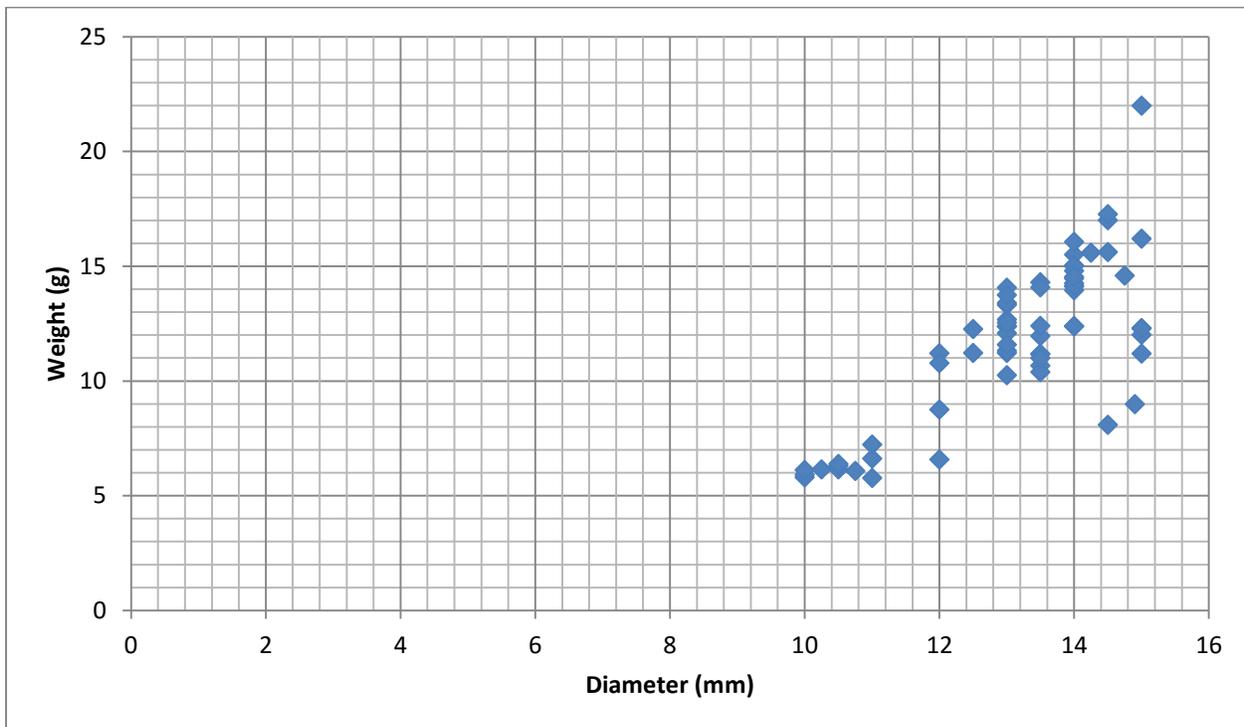


Figure 5.17. The correlation of diameter and weight of solid lead shot (≥ 10 mm dia.) from the St. Johns wreck.

Ballistics

A study of the ballistics of smoothbore firearms dating from the sixteenth to eighteenth centuries, conducted by firing antique black-powder guns held in an Austrian armoury, has provided important insights into the performance of smoothbore small-arms (Krenn, Kalas, & Hall, 1995). Of the guns test-fired, the average muzzle velocity was 454 meters/second, with 10 of 13 guns firing between 400 – 500 meters/second. But this fast rate is short-lived: spherical shot were found to lose speed at 2.5 m/s for every meter travelled in the first 24 meters. For a gun of similar proportions to those seen on the St. Johns wreck – a wheel-lock musket from 1593 – with a barrel of 64.5 cm and a bore of 13.2mm, it had a muzzle velocity of 427 m/s, which was diminished to 238 m/s at 100 meters. The same gun had a maximum range of 827 meters. An added, and significant, discovery from this study is that the type of gun had no effect on performance: black powder, smoothbore ballistics is independent of the design of firing mechanism or barrel manufacture. Guilmartin has noted that, much like larger artillery, small arms also have a muzzle velocity with a fixed upper limit, but this maximum is somewhat lower for firearms because of the diminished thermal efficiency of their smaller barrels (Guilmartin, 2004: 293).

There is no well-defined, contemporary account found of the effective range of an arquebus, though Humfrey Barwick, a proponent for the military use of firearms, outlined the range at which approaching troops should be fired upon with a musket and arquebus: “I would firste deliver a single Bullet, at 24 score (480 yards) off, or thereabouts, by that time they had marched fourscore nearer (400 yards), I would deliver another Bullet, and at 12 score (240 yards) two, and at eightscore (160 yards) three, at forescore (80 yards) 6.... Now even as I have declared for the Musket, so dooth it stand with the Harquebuz, but not to begin so farre off with the Harquebuz...” (Barwick, 1594: 17R-17V). Brown has estimated the effective range of an arquebus to be around 150 yards; with the ball able to penetrate good armour at 80 yards and light armour at 100 yards (1980: 42). Barwick noted that an arquebus could be fired forty times an hour, giving an average time of 90 seconds to load, aim, and fire (1594: 4V).

The Arquebus was supplemented with the larger, similarly-designed musket sometime in the middle of the sixteenth century. Collado Says of the musket’s performance: “The muskets ... shoot for most lead balls of two ounces, and are loaded with [powder] three quarters of the weight of its bullet, and with fine gunpowder, which for the level of the bore shoots little more than 200 paces, and for the point of its greatest elevation, or of the greatest shot, as we said that they shoot 600 paces, approximately” (1592: 26V).

Other Sites

The archaeological record certainly supports the idea that portable firearms crossed the Atlantic with European ships from the earliest days of American exploration. It is not clear if Columbus carried any firearms on the first voyage in 1492, but archaeological excavations at the 1493-96 settlement of *La Isabela* on Hispaniola have uncovered a bronze *hacabuche* fragment (Deagan and Crucent, 2002: 229-230). Portable firearms are also found on shipwreck sixteenth-century sites across the Americas. On the Molasses Reef wreck, four fragments of iron harquebus barrels were found, as well as corresponding lead shot that averaged 1.38 centimetres diameter and 14.8 grams (Keith, 1987: 212-213). At the Emmanuel Point I shipwreck of 1559, three solid lead shot ranging between 1.15 and 1.48 centimetres and 8.3 to 16.7 grams were found (Hunter, 1998: 150-151). One of the Padre Island 1554 sites had four lead shot, averaging 1.3 centimetres and 8.2 grams (Arnold & Weddle, 1978: 451), and another had two ranging between 1.2 centimetres and 1.35 centimetres, with weights from 8.4 to 13.8 grams (Olds, 1976: 88). At the Ines de Soto site off Cuba, a single, partial wooden stock from an harquebus remained (García del Piño, 1998: 190).

On the wrecks of the 1622 galleons *Nuestra Señora de Atocha* and *Santa Margarita*, which carried companies of 77 and 68 soldiers respectively, many dozens of both harquebuses and muskets, along with lead shot for them, were recovered. These 1622 harquebuses look to have been mass produced, all to the same specifications; an harquebus from these wrecks has a barrel of 104 centimetres, plus a tang of 1.7 centimetres, and a bore of 1.45 centimetres.

Elsewhere, military historian Jose Arántegui y Sanz examined firearms from Spanish museum collections and found a typical harquebus of the mid sixteenth century was from 10 to 12 pounds and of a calibre sized for a five-eighths ounce ball. In a drawing made from these guns, the harquebus has a barrel of 101 centimetres, and, including the stock, the gun is 136.5 centimetres, overall. The bore of the harquebus barrel is 1.65 centimetres. The musket, while similarly designed, is significantly larger, with a bore of 2.2 centimetres (see Fig. 5.1).

From evidence gathered seen in the wreckage, the firearms from the St. Johns wreck look to have been in storage when the ship sank. When needed, though, they would have given those on-board the ship another way to project force toward adversaries, whether at land or sea. The effective reach provided by such guns allowed the user to shoot a lead ball weighing roughly half an ounce somewhere around 100 meters, less if the guns were firing blasts of smaller pellets. This reach would have been very useful

for the defence of the ship, especially to keep boarders at bay. Supposing there was no company of soldiers on-board, these harquebuses were likely for use by the ship's crewmen, who, if following the best advice of the day, were well-versed in the use of firearms.



Figure 5.18. The locations of harquebus remains (indicated by red X's) on the St. Johns Wreck. This concentrated pattern suggests that the harquebuses were in storage in the ship's starboard stern at the time of the sinking.

Because all of the recovered examples are only portions of the originals, the length of an intact harquebus barrel from the St. Johns wreck is not known, but with barrel diameters ranging between 1.15 and 1.35 centimetres, and shot of hardly more than half an ounce, the St. Johns guns are smaller than those called for in many sixteenth-century Spanish harquebus manufacturing contracts. According to those documents, the size of the harquebus barrel was somewhat variable, roughly between 1 and 1.5 meters, and the shot to be fired was most-commonly sized between five-eighths and three-fourths of an ounce, or approximately 17.5 and 21 grams, of lead. The same relative-smallness is seen in the harquebuses found at other sixteenth-century Spanish-colonial shipwreck sites, which had shot in the same general range as the St. Johns examples, and none exceeding 1.48 centimetres diameter and 16.7 grams. Though there is no indication of it in the historical record, the archaeological evidence from these shipwreck sites hints at the idea that, for use on-board sixteenth-century Indies ships, smaller versions of matchlock harquebus were utilized; guns that were lighter and perhaps easier to manoeuvre in the crowded mix of people, rigging, and generally-closer quarters of a ship at sea.

Chapter 6: CROSSBOWS

An assemblage of at least nine crossbows comes from the St. Johns shipwreck site, and these tension-powered arms once joined the arquebuses as the hand-held projectile weapons on board the ship. The St. Johns crossbow collection is varied, and it consists of nine steel bows (prods), gaffles (cocking levers), stock fragments, triggers, and iron bolt points. These pieces give a very good insight into this class of weapon, and, as a group, they compare similarly to other Conquest-era crossbows, and they help to define the type of crossbow used in the Spanish maritime system in the early colonial era.

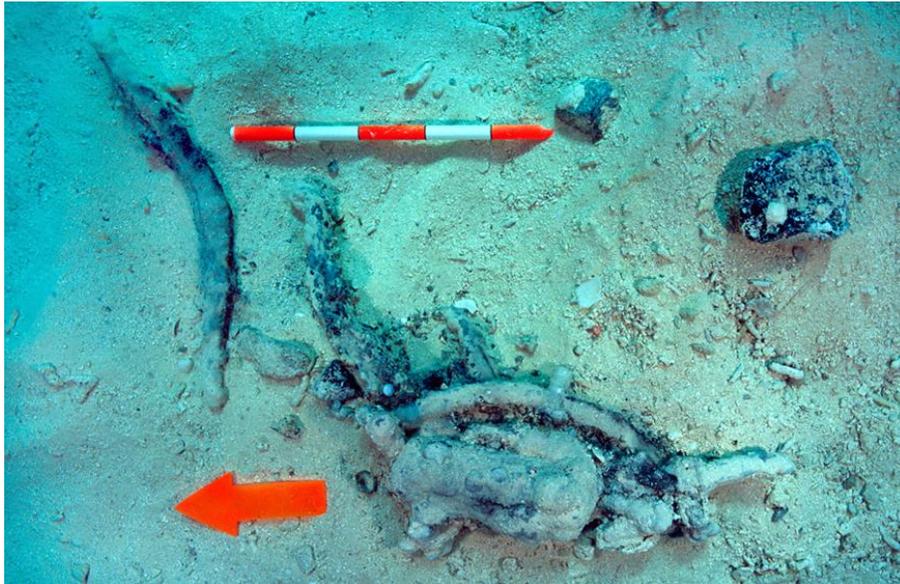


Figure 6.1. Crossbows after being uncovered from the sand at the St. Johns shipwreck site (scale = 50cm; arrow points north). (Photo: Dylan Kibler/MFMHS).

The crossbow remains were in a relatively small area of the wreck, at the south-eastern edge of the site. A concentration that is good evidence that they were stowed together, alongside the pole arms, swords, and arquebuses, indicating that all of these weapons were in the upper stern of the ship. Three of the bows were tangled together in a concreted clump, indicating that they must have been nearly side-by-side when they fell to the sea floor.

The History of the Crossbow

A Spanish historical military lexicon offers a good, basic description of the crossbow and how it worked: “[It is] a portable, ancient, weapon composed of a wooden stock like that of the modern rifle, with a channel by which arrows leave, driven by the elastic force of a spring, which was first made of wrought

iron and then steel, to the ends of which is tied a cord which is drawn tight with a gaffle and secured by a nut until set free at the moment of release, transmitting the propelling force of the said spring to the projectiles” (Serrano Larràyo, et al, 2009). An earlier, 1726 definition further illustrates the use of this weapon and sheds light on its use in the later colonial era: “A weapon formerly used in war to shoot arrows. Today it is used only for the fun of the hunt, by putting clay balls in it, called *bodoques*, rather than arrows. It has a stock of four to five hands long, two to three fingers thick, and in the forward end is set a flexible steel bow, in which a doubled cord is strung from one end to another” (Real Academia Española, 1726: 537). In an even earlier Spanish treatise on the weapon, the seventeenth century crossbow proponent Alonzo Martínez de Espinar wrote, “The crossbow is an instrument that was much-used earlier; than before harquebuses. In present times the crossbow has come to an end, and, likewise, along with it, the great crossbowmen” (1644: 5). But, he noted, “In Spain, in the past, they used this instrument more than any other place in the world” (ibid:12).

The crossbow appears to have been invented China in the third or fourth centuries BC and then spread to, or was independently invented in, the Greco-Roman world, (Blackmore, 1972: 172-173; Foley, Palmer, and Soedel, 1985: 104). The weapon was used in Europe from Classical times onwards, but it was widely popularized across the continent at the advent of the Norman-era in the eleventh century (ibid; Payne-Gallwey, 1903:3-4). Its increased popularity, and the resulting bloodshed, caused Pope Innocent II, in 1139, to declare its use against Christians as “hateful to God,” a view reaffirmed by Pope Innocent III at the dawn of the thirteenth century (Blackmore, 1971: 177). Despite official religious prohibitions, the crossbow’s effectiveness, with its ability to pierce armour from afar, made it too tempting for warriors to ignore, and, with the rise of castles at this same time, and the crossbow’s long-range abilities in defending them, the weapon only became more popular (Foley, Palmer, and Soedel, 1985: 104). The crossbow was eventually supplanted by the longbow in England, but it remained the weapon of choice for much of the rest of continental Europe (Payne-Gallwey, 1903: 4).

Early, medieval-era European crossbows, in an adaptation of Arabic hand bow technology, were made of a composite of glued strips of wood, sinew, and horn, which gave them both strength and flexibility compared to any one of these elements alone (Foley, Palmer, and Soedel, 1985: 106-107; Payne-Gallwey, 1903: 5). But around the dawn of the fifteenth century, steel crossbows began to appear, and they were unmatched in strength (Foley, Palmer, and Soedel, 1985: 107). A steel, military-grade crossbow had a maximum range of between 370 and 500 meters (400 and 550 yards), and a point-blank

range of 60 to 65 meters (65 to 70 yards) (DeVries and Smith, 2007:192; Payne-Gallwey, 1903: 20). The maximum range of a smaller, sporting crossbow was from 270 to 280 yards (Payne-Gallwey, 1903: 22).

Steel bows were a specialty of Spain, and much of the metal came from Mondragón, the same source for the fine steel of Toledo swords (Salas, 1950:200). One of the most famous bow-smiths of the conquest-era was a Catalan named Juan Roquete (ibid.), though there were others, some who specialized in just bows, others in various other iron and steel crossbow parts, and others in stocks (Martinez: 1644:12).

Steel bows were especially difficult to cock and required mechanisms of some sort to bend the bow and pull the cord into the firing position on the nut. To arm the crossbow, four different instruments were used (Escudo de La Peña, 1870: 300):

- “The method used by the first crossbowmen was the hook [*gancho*], which hung from the belt, with which, by bending down and putting their foot in the stirrup they pulled the cord onto the nut.
- The cranequin [*cranequín*], which was carried at the waist, served to arm the crossbow by meshing [a hook] with a geared wheel, by means of a crank.
- The windlass [*armatoste*], a cranking device with a winch of two handles, cords, and pulleys; different from the cranequins.
- Lastly, the gaffle [*gafa*], from which, it was said, to hook or snatch the crossbow [cord]. It was a type of hook, as indicated by its name, derived, according to Covarrubias, from the Hebrew verb *cafaf*, which means ‘to bend’.”

Early shipboard crossbows

Much like castles, ships offered advantages for the crossbow, and Italian historical records show that the transition from smaller, lateen-rigged vessels to larger, square rigged ships in the thirteenth century coincided with rise to the marine crossbowman (Lane, 1969). The larger ships offered a higher vantage point, which gave crossbowmen a greater sight-line and range, and the increased freeboard offered them greater protective cover. Historical records also show crossbows on Spanish ships from the Medieval to Early-Modern eras. Crossbows were used on Catalonian ships as early as the mid-thirteenth century, where warship regulations say of crossbowmen: “They must also carry two crossbows for two feet, and one of a stirrup, three hundred arrows, quilted doublet, breastplate, corselet, cuisse (thigh armour), iron helmet, knife, and two hooks.” Shipboard crossbowmen were also required according to 1354 ordinances of Pedro IV, King of Aragon: “The crossbowmen are forty for the large *galera*, and thirty for the smaller *galera*: and each must embark with full armour, two crossbows, two hooks, and one for

two hands, and two hundred arrows; one hundred of proof, and one hundred of munitions-grade... Also in the said number of men there should be a good master crossbowman with his equipment..." (Pedro IV, 1354 [1787]: 25). In 1493, as part of a fleet organized to protect Spain's new, westward shipping lanes, 115 crossbows were carried, including seventy-seven of eight pounds, seven of seven pounds, twenty-nine of six pounds, and two of five pounds, all with their "pulleys" [*garruechas*] (Diaz de Trabco, 1493 [1878]:425-427).

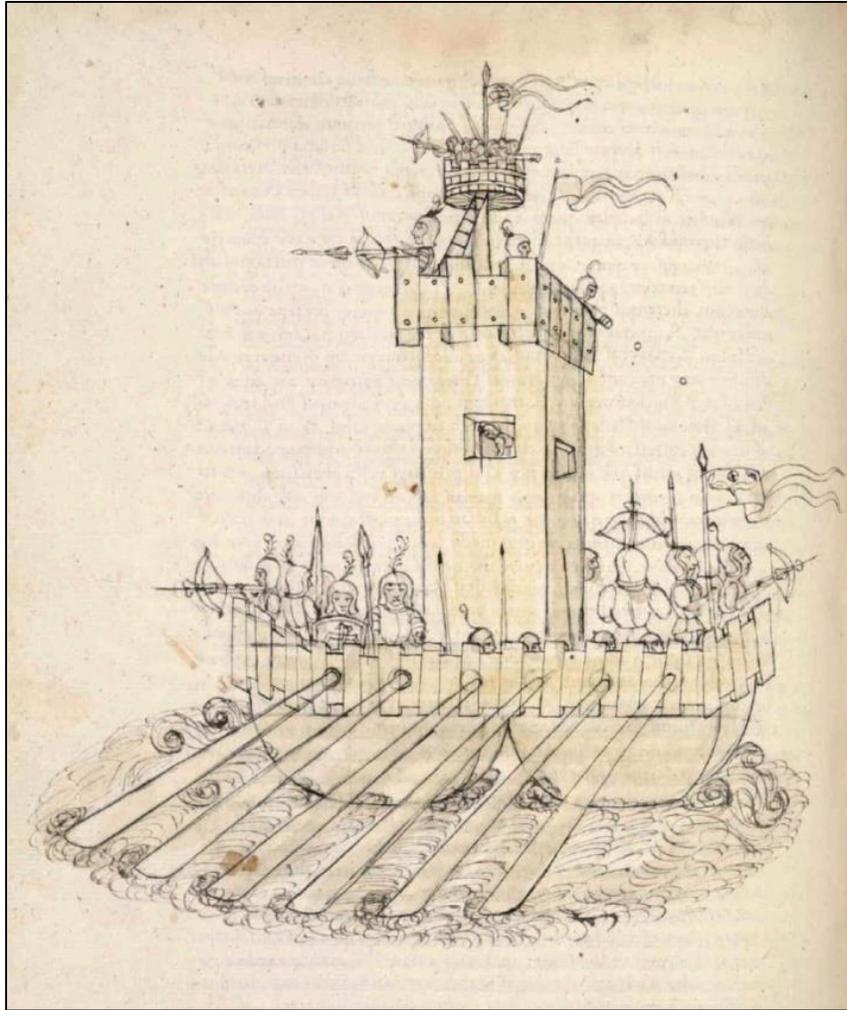


Figure 6.2. Crossbowmen defending a floating pontoon fortress; an early illustration of crossbows on watercraft. (Print: Robertus Valturius, *De re militari*, 1472, Library of Congress).

At the beginning of the sixteenth century, a Spanish royal *galera* listed the following number of crossbows amongst its weaponry: "Item: 30 crossbows of steel with their gaffles. Item: eight stout crossbows for penetrating, with five jacks and cranequins. Item: eight boxes of arrows, three of them with 62 dozen proven arrows for penetrating crossbows: four of them with 120 dozen of proven arrows

for the common crossbows: and the other box with 25 dozen munitions-grade arrows"(Ferrer, 1503 [1787]: appendix, p.30).

On Indies-bound ships, crossbows were used through much of the early colonial period. Among the recommendations Columbus made to Queen Isabela and King Ferdinand, for the equipment needed on the ships for his 1498 voyage, were "crossbows, and cords for the crossbows, and a storage area for the crossbows" (Fernández Duro, 1892:52). By 1522, an Indies ship of 100 tons was required to carry ten crossbows and 16 dozen darts (Carlos I, 1522). In the following decades, ships of 120 tons were to carry twelve crossbows, and ships of 320 tons were to carry thirty (Carlos II, 1681: F45R-46R). In 1557, the Honduras-bound *Los Tres Reyes Magos*, a cargo carrier of unknown tonnage, carried twelve crossbows and three dozen bolts in its arsenal (Casa de Contratación, 1557).

Historical and archaeological evidence show the Spanish used the crossbow throughout the New World in the early colonial period, from the dawn of the era through the later part of the sixteenth century. Iron crossbow bolt-points and a bronze trigger were found at the site of La Isabela, Columbus' late fifteenth century settlement at Hispaniola (Deagan and Crucent, 2002: 169). When Hernan Cortes mounted his fateful exploration of Mexico, he had eighty-two crossbowmen and thirteen harquebusiers amongst his men (Bruhn de Hoffmeyer, 1986: 18). A 1538 directive from the office of Queen Consort Isabela to Francisco Pizarro, ordered that all Spaniards in Peru be provided with weapons, "especially crossbows," and each resident and inhabitant of the colony was to be given a crossbow and its equipment (Isabela, 1538). By 1551, for reasons that are not clear, perhaps for fear of rebellion against Spanish rule, Native Peruvians were explicitly forbidden from possessing crossbows (and harquebuses) without government license (Prince Philip, 1551). Crossbows were also used extensively by the Spanish in their exploration and colonization efforts in North America. Archaeological evidence makes clear that Hernando de Soto used crossbows in his 1539-40 exploration of Florida (Tesar and Jones, 1989). Vasquez de Coronado carried crossbows in his 1540-1542 trek through the southwestern United States (Winship, 1896:496; 557). In addition, archaeology shows that Tristan de Luna also relied on the weapon in his attempted settlement of the Pensacola, Florida in 1559 (Hunter, 1998: 147-150). Pedro Menéndez brought crossbows from Spain in the supplies for the 1565 settlement of Florida (Lyon, 1992:35). Juan Pardo carried crossbows in his 1566-1568 exploration of what is now the Carolinas and Tennessee (Hudson and Hoffman, 1990: 341-342). Excavations at the short-lived 1566-1587 settlement of Santa Elena in South Carolina, uncovered multiple, iron gaffle fragments, a crossbow trigger, and at least six iron crossbow bolt-points, indicating the crossbow was a significant weapon at that place and continued

to be used in the Americas into the last third of the sixteenth century (South, Skowronek, and Johnson, 1988: 100-107).



Figure 6.3. In a print titled “Pedro de Alvarado companion at arms of Hernando Cortes besieged by Aztec warriors,” Spanish conquistadors use crossbows and firearms to defend themselves against Native Americans. (Print: Codex Duran, ca. 1581, Biblioteca Nacional, Madrid).

Crossbows continued to be used with regularity in continental Spain at least up to the early 1570's, as evidenced by the sixteenth-century Spanish historian Diego Hurtado Mendoza who noted that crossbows were used in great numbers alongside arquebuses in the battles of the 1568-71 Morisco rebellion in Granada (1827: 125; 130; 143). Tellingly, though the Spanish ship *La Trinidad Valencera*, sailing in the Armada of 1588, carried two boxes of chestnut wood bows (Flanagan, 1988:92), there is no evidence for crossbows having been associated with that massive military fleet in its attempt to invade England. And no crossbows or crossbow parts have been found on the wrecks of the 1622 Indies galleons *Nuestra Señora de Atocha* or *Santa Margarita*, wrecked at the Florida Keys and both of which were manned with squadrons of royal marines. It would appear from the historical and archaeological evidence that crossbows fell out of general military use by the Spanish somewhere between the mid 1570's and the early-to-mid 1580's, and did not return. This does not mean, though, that the use of the crossbow ended completely; crossbows were being imported into the Americas for personal use well into the seventeenth century; the latest official document is a Crown license for six crossbows amongst a variety of arms and armour being sent by a colonist into Mexico in 1626 (Philip IV, 1626).

One of the earliest detailed descriptions of Spanish crossbows, with an accounting of their various parts, comes from the early seventeenth century writings of Alonzo Martínez de Espinar, who describes the hardware and fittings of sporting crossbows as follows (1644:22-24):

“The iron and bone components that compose the crossbow and its accessories:

- The wooden stock of the crossbow has two names *cureña* or *tablero*, one is the same as the other.
- The irons that are on the stock where the nut is, and on the head, are called cheek-plates [*quijeras*]. They are flush with the wood and in line with its surface.
- The irons that reinforce a hole that runs through the stock near the head are called flowers [*flores*] and they have one on each side.
- The key (trigger) that disarmed the crossbow is one long iron that is at the bottom face of the stock, and all of it that enters into [the stock] is called the foot of the trigger, and that by bringing it closer to the iron stock cheek [*quijera*], it quickly releases.
- Under from the trigger is a small thin stick, which is called the spring [*muelle*] and it works to raise and lower the trigger when one charges and discharges the crossbow.
- The stock, it likewise has a bone in which the cord is charged, and this is called the nut, which is made of what deer have in their heads, in the base of the horns, and those of another animal do not have the same effect.
- The nut has in the middle a wedge of steel, which inside encounters the trigger, and they grasp one to the other when the crossbow is armed.
- Where the nut rolls and moves in the stock is called the box; it is lined/reinforced with two small bones, one for the upper part and the other for the lower, and they are called the fore-wedge [*antepecho*] and aft-wedge [*traspecho*].
- In the face of the stock, forward of the nut, there is another long bone that is called the channel. And the stock from the nut back, *rabera*.
- A small iron that is at the head of the crossbow, in ring form, is called the stirrup.
- It also has two pins of steel: one set into the stock and cheek-plate by which the trigger is held; another that is outside of them, which it is enough that the blades of the gaffle can roll on them, when the crossbow is being charged.
- These are the bones and irons of this instrument, outside of the gaffle and *verga* [bow]; and to be perfect, it should have the following things: “tastiness” [*sabrosa*, i.e. a desirable quality] on the face from which it fires, so that it does no damage in it; smoothness of discharging, and reliability to not release when it is charged.”

Martinez’ thorough descriptions of the various crossbow components were written after the weapon’s heyday, and they describe non-military, sporting bows, but they are still quite helpful in understanding the remains of the St. Johns collection.

The St. Johns Crossbows

The Bows

The St. Johns wreck yielded the remains of nine steel bows; six have been cleaned and conserved, and three others remain encrusted and in the form in which they were found on the sea floor. The forms of all of the conserved bows were recovered by casting them of epoxy resin from the calcareous marine encrustation that formed on them while underwater; the original steel long corroded and gone. These resin casts are very detailed and faithful to the original objects. Many of the bow forms are coupled with cheek-plates and small portions of the wooden stocks.

92-0927



Figure 6.4. Crossbow 92-0927. (L to R) top, end-on, and underside views.

St. Johns bow 92-0927 is 61.6 centimetres long, and is set through an iron cheek-plate, U-shaped in cross-section, that covers the two sides and the bottom of the stock (Fig. 6.4). A thin, wooden wedge sits between the forward face of the steel bow and the stock, to tighten their join (Fig. 6.5). Riveted iron through-pins held the cheek-plate and the wood together. The cheek-plate and stock taper in two dimensions: they widen at the upper surface from 3.4 to 3.6 centimetres going toward the rear; at the bottom face it narrows to a steady 2.7 centimetres. The upper edge of the bow pitched forward in the stock, which would allow the ends of the bow-arms to be slightly elevated above the stock, so the cord would not drag across it when fired. Forward of the bow, the bottom face of the stock is shaped with a scalloped taper that diminishes slightly toward the front. There is no evidence of an iron ring or stirrup at the forward end of the stock.



Figure 6.5. Detail of the bow/stock intersection of crossbow 92-0927. The thin wooden wedge can be seen at the forward face of the bow. An iron rivet is at the upper rear. There is no evidence of a ring or stirrup forward.



Figure 6.6. Three views of the wooden remains of the stock 92-0927: Right side, left side, and underside.

During the conservation process, the wood of the stock that survived underneath the encrustation of the corroded iron cheek-plate was briefly exposed and documented (Fig. 6.6). The piece revealed the bow-slot was slightly wider than the bow, and it canted forward at the top. The faces of the wood are also morticed, so the surface of the cheek-plate would be flush and smooth when mounted with the stock. Eight holes for the iron rivets that once held the cheek-plate pass through the sides.

96-2148



Figure 6.7. Crossbow 96-2148. (L to R) top, end-on, and underside views.

Bow 96-2148 is incomplete, with one end lost to corrosion (Fig. 6.7). The bow is set into a small, slightly bent, bronze cheek-plate that held a stock 3.8 centimetres wide at its upper surface. A small portion of the stock's wood has survived. Though it is incomplete, the bow's original length was very near 61.0 centimetres, a bit bigger than the average St. Johns bow. This bow is distinguished from the others in the collection in that it is much squarer in cross-section than the others: it is 2.5 centimetres wide (or tall) and 1.8 centimetres thick at the centre of the arc. The prod maintains this thicker than average profile all the way to the end.



Figure 6.8. The bow/stock intersection of crossbow 96-2148, showing the bent, bronze cheek-plate.

96-2012



Figure 6.9. Crossbow 96-2012. (L to R) top, end-on, and underside views.

Crossbow bow 96-2012 measures 54.7 centimetres across and is relatively flat in profile. The prod bears a small portion of wooden stock at its centre point, which is reinforced by a section of an iron cheek-plate (Fig. 6.10).



Figure 6.10. Detail of the cheek-plate and stock on the forward side of bow 96-2012.

The U-formed cheek-plate shows that the stock was 3.2 centimetres wide at the upper edge and that it tapers downward to 2.1 centimetres before turning into a rounded bottom. The cheek-plate was held to the wood by at least one iron pin. A small dot is stamped or drilled into the interior face of the prod at its centre-point (Fig. 6.11). Though the purpose of the dot is unclear, it does not appear to be a maker's mark. Instead, it looks to align with the stock and seems more likely to be a marker to assist in the proper placement of the bow within the stock.



Figure 6.11. Detail of the centre of the inside face of crossbow 96-2012. A stamped dot can be seen in alignment with the stock.

96-2097



Figure 6.12. Crossbow 96-2097. (L to R) top, end-on, and underside views.

Crossbow 96-2097 is unusual in that it has the flattest curve of the St. Johns collection, with arms that emerge nearly straight out from the more-curved centre-point; even the cord attachment points are only very slightly curved (Fig. 6.12). It is also, by far, the widest of the bows, with a measure of 4.2 centimetres at the centre. This bow is also distinguished from the others in that it is forged from two bars of steel that run parallel to each other lengthwise and are joined down the middle for the span of the bow. A distinct dot is set into the centre-point of the backside of the bow, again, as what appears to be a guide mark for the stock (Fig. 6.13). None of the bow's stock or its hardware has survived. This bow has its lower edge curved upward, which is another way to set the ends of the arms slightly above the stock and prevent the cord from dragging across the stock's upper surface when fired.

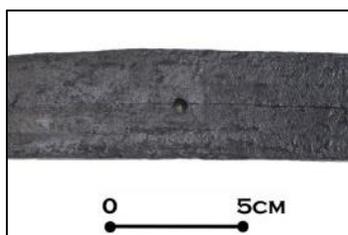


Figure 6.13. Detail of mark placed at centre-point of the bow's interior face. Note the weld line running across the central length of the bow, indicating where two steel bars joined to fashion the piece.

96-2111



Figure 6.14. Crossbow 96-2111. (L to R) top, end-on, and underside views.

Crossbow 96-2111 has a nearly complete, 13.2 centimetres long cheek-plate that intersects with the bow (Fig. 6.14). The bow cants forward at the top edge to raise the ends of the arms. The upper surface of the stock is 2.9 centimetres wide at the forward end and 3.2 at the rear. The cheek-plate is a solid plate (minus the openings for the bow) generally shaped into a “U” to wrap around the two sides and bottom of the stock (Fig. 6.15). Forward of the bow, the plate and stock have a scalloped taper that diminishes toward the front. From the bow and on back, the cheek-plate is flat-bottomed and 2.3 centimetres wide. Iron pins that held the cheek-plate to the stock run through the wood, from side to side. There is no evidence of a wedge set between the bow and the stock. The stock is mounted slightly off-centre on the bow, perhaps a slip in the aftermath of the sinking. This bow is notable within the St. Johns collection in that it has the most pronounced bow-curve and re-curves at the ends of the arms.



Figure 6.15. Two views of the cheek-plate/prod interface of crossbow 96-2111.

96-2123



Figure 6.16. Crossbow 96-2123. (L to R) top, end-on, and underside views.

Bow 96-2123 was found as a bow only, with no cheek-plates or stock. It is 54.2 centimetres long and is strikingly similar in size and shape to bow 96-2012 (Fig. 6.16). This bow also has a shallow dot at its centre-point (Fig. 6.17).

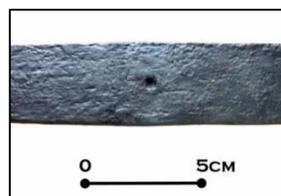


Figure 6.17. Bow 96-2123 also has a dot set into its centre-point on the backside.

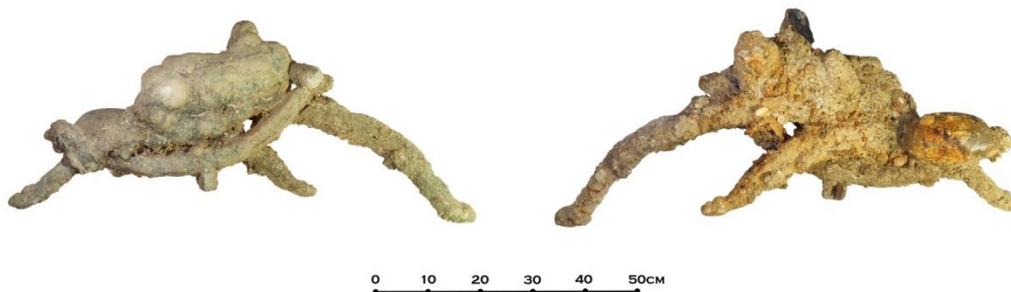


Figure 6.18. Encrusted Crossbow Cluster 96-2152, top and bottom views.

The three steel bows of artefact conglomerate 96-2152 are tangled together with a verso breech chamber, and they remain unconserved and concreted as found (Fig. 6.18). Their full dimensions are masked, but close estimates of the bows' overall lengths have been measured – 51.0, 56.0, and 57.0 centimetres – showing one bow is the smallest of the St. Johns collection, and the other two are very near the collection's average length of 56.5 centimetres (see Table 6.1). A chip in the encrustation shows that the smallest bow has a bronze check-plate mounted at its centre-point. With these three bows so thoroughly intertwined, it is good evidence that they were stored in very close proximity on board the ship as it sailed.

Clearly, many of the St. Johns bows mounted in various styles of iron and bronze cheek-plates to help unify them with their stocks, but there is no evidence of bow irons set on either side of the bow at the stock to help further hold the bow tightly in position (*flores*, or “flowers” as described by Martinez). Instead, it appears that the St. Johns bows were more likely bound to the stocks with bridles of sinew or cord, and that these organic bindings decomposed over time. A small fragment of fibrous cord found at the appropriate position for such a bridle survives on the underside of bow 92-0927, reinforcing this idea (Fig. 6.19).



Figure 6.19. Likely Fragment of organic Bridle Cord preserved on Crossbow 92-0927.

| Tag # | L.O.A. | Width at Centre | Width 5cm from End | Thickness at Centre | Thickness 5cm from End |
|---------|-------------|-----------------|--------------------|---------------------|------------------------|
| 0927 | 61.6 | 3.25 | 2.2 | 1.6 | 0.9 |
| 2012 | 54.7 | 3.0 | 2.0 | 1.4 | 0.8 |
| 2097 | 57.5 | 4.2 | 2.1 | 1.0 | 0.6 |
| 2111 | 55.7 | 2.9 | 1.7 | 1.7 | 1.0 |
| 2123 | 54.2 | 3.3 | 2.4 | 1.4 | 0.9 |
| 2148 | 61.0 (est.) | 2.5 | 1.4 | 1.8 | 1.1 |
| 2152a | 51.0 (est.) | n/a | n/a | n/a | n/a |
| 2152b | 56.0 (est.) | n/a | n/a | n/a | n/a |
| 2152c | 57.0 (est.) | n/a | n/a | n/a | n/a |
| Average | 56.5 | 3.2 | 2.1 | 1.5 | 0.9 |

Table 6.1: Dimensions of the St. Johns Steel Bows (measurements in centimetres).

Stock, Cheek-plate, and Nut 96-2137b



Figure 6.20. Crossbow Stock 96-2137b.

A section of crossbow stock at the point of the trigger and nut contains important details about the firing mechanism (Fig. 6.20). A folded, 0.45 centimetres thick iron plate, 10.4 centimetres wide by 11.9 centimetres long, shaped into a “U,” made a cheek-plate that covered the two sides and bottom of the stock. The original iron of the cheek-plate had decomposed, but its form was recovered by casting it from the marine concretion. Some of the stock’s original wood survived, but it was badly worm-eaten and infused with rust. Because the cheek-plate was flush with the surface, though, it reveals some of the dimensions of the deteriorated stock. At this point, the stock is consistently 3.9 centimetres tall, and it is 3.25 centimetres wide along the bottom face. The upper surface tapers, though, from 3.9 centimetres at the forward end to 3.5 centimetres at the aft end. Two Iron pegs, each 1.2 centimetres long and 0.6 centimetres in diameter, are set towards the upper rear of both sides of the cheek-plate. These pegs were for the arms of a gaffle to ride along and lever against during cocking. The nut that held and released the bowstring looks to have been made of iron or steel; it was a rusted void in the concretion and was recovered through resin casting. The nut is set between two curved lead plates – each roughly 0.5 centimetres thick and 2.9 centimetres wide – that appear to have held it in place and served as

buffers between the rolling nut and the wood of the stock. These plates are the *antepecho* and *traspecho* described by Martinez.

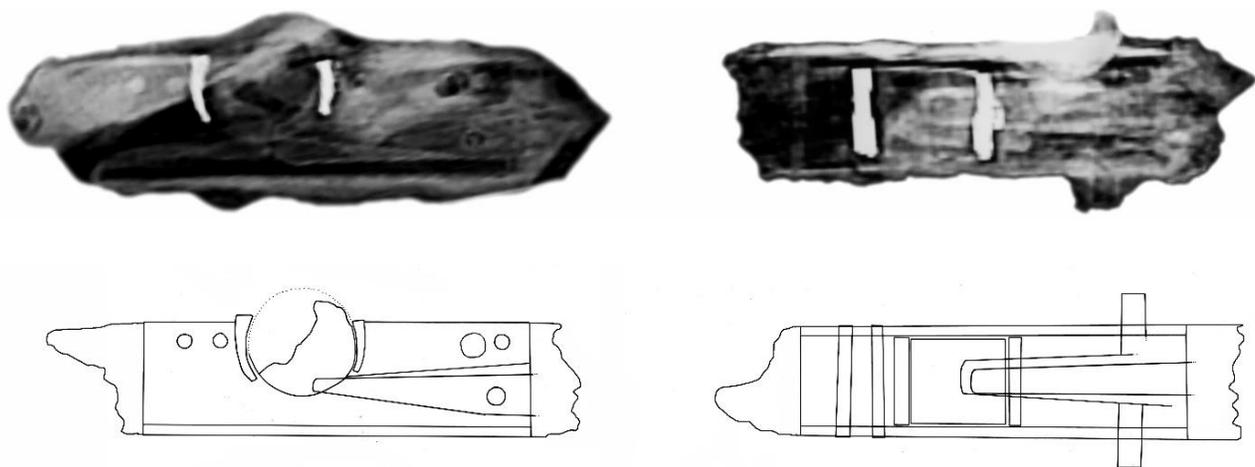


Figure 6.21. X-ray images and drawings of the firing mechanism of crossbow stock 96-2137b.

X-ray images of the section of stock reveal additional aspects of the construction of this section of stock and how the firing mechanism worked (Fig. 6.21). The disc-like nut is set into a rounded hollow nearly as wide as the space between the cheek-plates, and it has no sort of visible axle on which it turns. Instead, the curvature of the two lead wedges at its front and back appear to hold it in place. The nut itself is degraded and incomplete, but it looks to have rolled forward, into a “post-release” position. Further inside, the trigger is set into a groove that runs down the centreline of the stock. The forward end of the trigger sits tucked into a slot at the base of the nut, and it mounts a pin through its sides that allowed it to pivot up and down. As the trigger was levered downward on its pivot point, the forward end went upward and engaged with the nut, locking it in place. When the trigger was squeezed toward the stock, its forward end went down and disengaged, which allowed the nut to roll forward and release the cord. Unfortunately, the sea completely corroded the portion of the trigger behind its pivot point. Not all of the details of the morticed space in which the end of the trigger was set were discernible.

Gaffles

A gaffle is a type of folding, iron lever used to pull back the cord on the crossbow and cock it in place. The gaffle was invented in the later fourteenth or fifteenth century, and, because of the shape of its unusually curved arms, it is also known as a “goat’s foot lever” (Payne-Gallwey, 1903:84; Laking, 1920:137). To bend the bow and set the cord, the gaffle worked by hooking two claws onto the cord and the user pulling the long lever bar to draw the cord back into the lock (figure 22). The gaffle was levered against iron pegs mounted on the stock behind the lock. This device was simple to use and was reliable in all sorts of conditions.

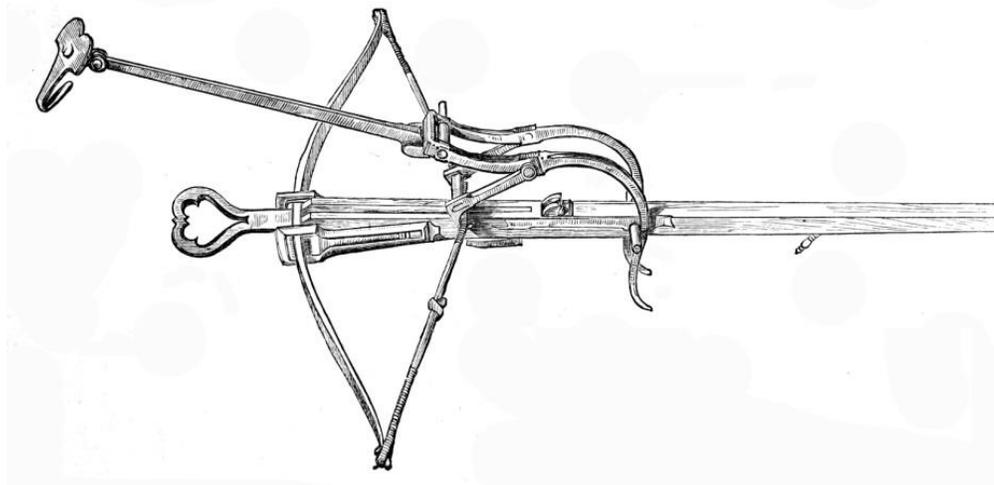


Figure 6.22. Detail of Gaffle and Crossbow. (From Viollet le Duc, 1874: 33).

As has been noted earlier, there were multiple devices used to bend bows for firing, but it looks as if the gaffle was the only one used on the St. Johns shipwreck. In the site’s collection are the remains of six iron or steel gaffles. As with the bows, the forms of these pieces have been recovered by casting them from the marine concretion moulds that formed around their degraded remains. These gaffles are the only type of crossbow cocking device found on the ship and there is a comparable number of gaffles to that of prods. One gaffle, and the portion of stock and firing mechanism described above, were concreted together; their relationship literally cemented. Because the conserved gaffles are resin casts, they are single, static pieces; how they moved and performed is obscured. Though they are immobile, these pieces are clearly complicated and precisely made to ensure smooth and true cocking of the bow. They are, as was described for gaffles recovered from the 1554 Padre Island shipwrecks, “lean, spare, and efficient, with every element calculated to a nicety” (Arnold, Watson, and Keith, 1995:13).



Figure 6.23. Gaffle 93-1471a

Gaffle 93-1471a was found concreted together with 93-1471b, and though both gaffles are bent, they offer the most complete examples of arms from the collection. From the head, where the arms and handle meet, to the end of the handle, the piece is 29.5 centimetres long (Fig. 6.23). At the end of the head, the piece is 4.4 centimetres wide on the outside and 3.7 centimetres wide, inside; an indicator of the stock width for which it was designed.



Figure 6.24. Gaffle 93-1471b

Gaffle 93-1471b is 26.7 centimetres long; it has an outside width of 4.8 centimetres and an inside width of 3.6 centimetres (Fig. 6.24). A small, T-shaped finial caps the end of the lever handle. One of the cord hooks broke away from the piece and was cast separately. Like its counterpart piece, 93-1471a, this gaffle has finely finished, long, slender, and nicely curved arms. Surprisingly, considering the expert skills that went into fashioning these gaffles, none show any trace of a maker's mark.



Figure 6.25. Gaffle 95-1846

This gaffle is 23.1 centimetres long, but it does not look to be quite complete, as the ocean corroded the ends of the blades and the lever bar (Fig. 6.25). It is 3.5 centimetres wide on the inside, at the head of the piece, and 4.9 centimetres wide on the outside.



Figure 6.26. 96-2137a

Gaffle 96-2137a was concreted with stock-section 2137b (see Fig. 6.20). The gaffle is 21.6 centimetres long, from the head to the end of one of its arms (Fig. 6.26). The arms of this gaffle are shorter and thicker than those of 93-1471a/b are. The end of the lever arm is incomplete. The piece is 4.7 centimetres wide on the outside and 3.6 centimetres on the inside. The inside width measure matches closely with the 3.5 centimetre width of the stock at the point of the gaffle pegs.



Figure 6.27. Gaffle Fragment 96-2148d

Gaffle 96-2148d is a small fragment of only the forward end, and it is made of resin cast from marine concretion. This piece was found in an artefact conglomerate that included a trigger fragment, a fragment of an harquebus barrel, and an iron nail. It has an outside width of 4.5 centimetres, and an inside width of 3.3 centimetres.

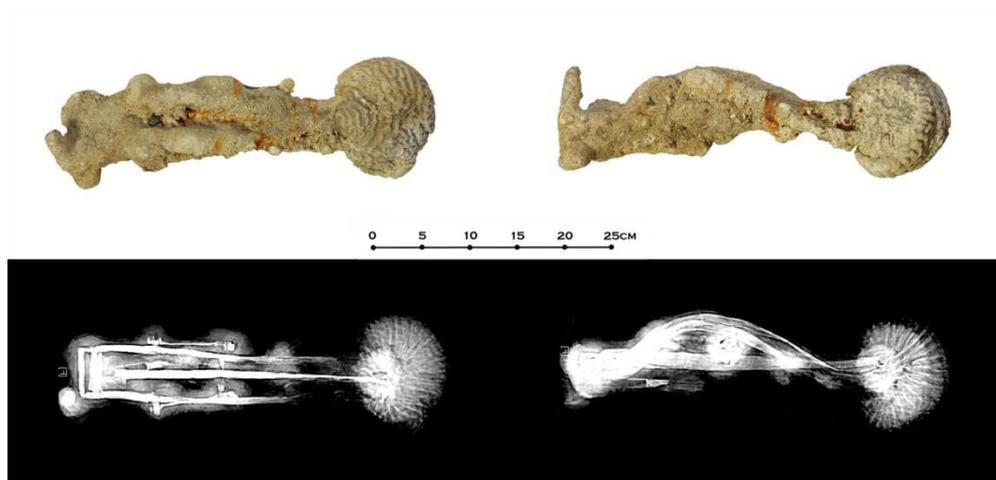


Figure 6.28. Gaffle 93-1361. Two views of the encrusted artefact (top) and two X-ray images of those same views.

Gaffle 93-1361 remains encrusted as recovered from the shipwreck site. X-rays show that it is nearly complete and is similarly designed to the other St. Johns examples, with the same long, thin arms as seen on example 93-1471b (Fig. 6.28). The X-ray also shows that this gaffle, compared to the others, has much more, but not all, of the original iron remaining, which makes its conservation more of a challenge.

Gaffles of similar design, all dating to the sixteenth century, are found in the collections of the Metropolitan Museum (Breiding, 2013: 112-117), the Spanish Royal Armoury, the 1554 Padre Island shipwrecks, and the Santa Elena settlement. A later, similar gaffle dating to the early seventeenth century comes from near Jamestown, Virginia (Peterson, 1956: 10).

Triggers



Figure 6.29. Trigger 92-0858

Trigger 92-0858 is also cast from the encrustation that formed around the original iron, and the revealed form shows a bent trigger that measures some 60 centimetres long from end to end (Fig. 6.29). The long arm of the trigger is approximately 46 centimetres long, and it leads into a Z-shaped bend that would fit up into the stock, behind and below the nut. The bend then leads into a flattened, wedge-shaped trigger tongue that pivoted on iron pins protruding from the sides. From the pivot pin to the end of the trigger's tongue is 6.4 centimetres.



Figure 6.30. Trigger fragment 96-2148c

A cast portion of a second trigger comes from another encrustation (Fig. 6.30). What survives of this piece matches almost exactly with the corresponding portions from trigger 92-0858. It was made of iron that is rectangular in cross-section, measuring approximately 1.25 by 1.0 centimetres. The same Z-shaped curve is present. Though this trigger fragment matches closely with the other, more complete example, there is some confusion as to whether it belonged to a crossbow or an harquebus: This piece was part of a conglomerate that contained a piece of a crossbow gaffle, and a fragment of harquebus barrel.

Bolt-Points



Figure 6.31. Casts of iron bolt-points 93-1432-P (top) and 93-1426-L (bottom).

Two bolt points from the wreck are cast from the concretion that formed around their original iron. Interestingly, they are of significantly different size. The larger is 4.9 centimetres long, and, measuring the diameter of the ferrule's distal end, it mounted on a shaft of 1.1 centimetres diameter. It has a four-faced head that is 2.1 centimetres long and 0.9 centimetres wide. The other point is considerably smaller and sligher, at 3.4 centimetres long, and it mounted on a shaft of 0.8 centimetres. The four-faced head is of a pyramidal design 0.8 centimetres long and 0.6 centimetres wide. The two have solid heads and conical ferrules made of sheet iron that overlaps, indicating the bolt-heads wrapped over the bolt shafts to hold them in place. It unclear if any adhesive compound was used to further secure them. A possible indicator that different makers made the two points is that, when looking down the length of the piece, toward the point, the smaller one's ferrule overlaps from left to right, and the larger one's from right to left.

Spanish military historian Jose Almirante lists five types of projectile fired from crossbows: "Crossbow projectiles were *bodoques* [balls], *pasadores* [thin arrows], *viras* [arrows or darts], *virotes* [metal tipped darts], and *viratones* [larger dart or arrow], all falling under the generic name of *lances* [missiles]"

(Almirante, 1869: 135). Drawing from these descriptions, it seems that the St. Johns examples would be best categorized as varieties of *virotas*, but how the two sizes would be classified further is unclear. Laking defines a type nearly identical to the larger of the St. Johns points as a “common bolt head, for purposes of war” (1920:144). The St. Johns points also match what Payne-Gallwey calls military crossbow bolts: “solid metal, prolonged to a hollow sheath to fit over the wooden shaft,” and such iron points would have been effective against most armour of the day (1903: 18). The shafts themselves would have been around 12 inches long (30 centimetres), fletched with feathers or leather, weighing ca 2.5 ounces (70 grams) total (Laking, *ibid.*; Payne-Gallwey, 1903: 126).

Other Crossbows

Crossbows of the variety represented by the St. Johns collection have not survived through time in large numbers, but parallel pieces do exist. Payne Gallwey illustrates an example of an isolated steel bow that is similar in design to many of the St. Johns examples, especially the relatively flat bow 96-2097, but one that is significantly larger at 76.2 centimetres long (1903:102, Fig.58). In the Wallace Collection, there is a ca. 1550 crossbow that once belonged to Charles V; it has a steel bow, a long, straight stock, no fore-ring, and used a gaffle for bending (Laking, 1920: 138). Another crossbow of uncertain provenance, but also dated to ca. 1550, is in the collection of the Albuquerque Museum (Karcheski, 1990:25-26). This crossbow is a steel bow some 64.1 centimetres across, with a straight, narrow, and slightly tapering stock 92.25 centimetres long. It has a folded, U-shaped cheek-plate fitted over the stock in the area of the nut, and two pegs for a gaffle protrude from either side of it. There is virtually no decoration found anywhere on the crossbow. Though it is a bit larger than the longest of the St. Johns bows, it has many features in common with the St. Johns examples.

Six sixteenth-century crossbows are in the collection of the Royal Armoury in Madrid, and of those, five are of a smaller design and are labelled “sporting” crossbows (Calvert, 1907: plates 197, 204). These bows are of steel and the stocks are long, slender, straight, and designed for gaffles. Two of them have ivory inlays for decoration. Two more Spanish crossbows dating to ca. 1540-1560 with steel bows of 54.6 and 64.4 centimetres are found in the collections of the Metropolitan Museum of Art (Breiding, 2013:37), and they, too, are very similar to those of the St. Johns wreck. They have slender and straight stocks of 82.9 and 92.1 centimetres, bronze cheek-plates where the bow meets the stock, cheek-plates at the nut and trigger, gaffle pegs, long steel triggers, and hemp bridles to hold the bows. Both crossbows are undecorated and plainly utilitarian. The Metropolitan crossbows were once part of the same, early Spanish collection, and both have Spanish marks indicative of a mid sixteenth century date.

Similar crossbows also appear in sixteenth-century artworks, especially in paintings depicting the martyrdom of St. Sebastian (Fig. 6. 32).

These other, complete crossbows give an indication of the likely original stock/bow proportions for the St. Johns collection. The Albuquerque bow has a bow-length to stock-length proportion of 1:1.44; the Wallace Collection bow 1:1.78; the Metropolitan bows have ratios of 1:1.52 and 1:1.43; and the Spanish Royal Armoury crossbows are 1:1.78, 1:1.7, 1:1.78, 1:1.44, and 1:1.43. It is perhaps a reflection of manufacturing standards that four of the nine bows have bow/stock length ratios of ca. 1:1.44, and four are between 1:1.7 and 1:1.78. Applying these ratios to the smallest and largest of the St. Johns bow lengths gives a range from 73 centimetres for the shortest stock length, to 110 centimetres for the longest.



Figure 6.32. A crossbow of similar size and design to the St. Johns bows.
(Detail from Gregório Lopes, *Martírio de São Sebastião*, c.1536, Museu Nacional de Arte Antiga, Lisbon).

The sites of sixteenth-century Spanish Indies shipwrecks have also been a source of crossbows, or at least evidence of them, and these shipboard bows offer what are perhaps the closest parallels to the St. Johns examples. At the Molasses Reef wreck, the remains of two crossbows were found. The collection was composed of two cheek-plates and two bows; one bow was partially preserved and the other was an impression in concretion (Keith, 1987:213-215). Both had cheek-plates made of bronze, and they fastened to the stock with a mixture of iron and bronze rivets. Wooden wedges were at the centres of

the forward faces of both bows to tighten them within the stocks, and a small portion of a five-strand sinew bridle was associated with one of these. Only one of the Molasses Reef bows was measurable, and apart from what might be an underestimated 41 centimetre length, the width and thickness figures compare favourably to the general dimensions of the St. Johns bows. The Emanuel Point I shipwreck, a ship that was part of Tristan de Luna's 1559 settlement effort at Pensacola, Florida, has yielded four crossbow bolt-points. These points are styled similarly to the St. Johns points, but instead, they are all made of copper (Hunter, 1998:147-149; Bratten, 2009: 112-113).

Of the two known shipwrecks of the Spanish 1554 fleet wrecked near Padre Island, Texas, both have evidence of crossbows. One of the wrecks had only a cord-hook from a gaffle (Arnold and Weddle, 1978: 252-253). The other wreck, though, site 41WY3, had the relatively well-preserved remains of at least three crossbows (Olds, 1976:89-98; Arnold, Watson, and Keith, 1995). Two of these bows are mounted in their stocks, one was found alone, and a third piece of stock has no bow. The bows are of the same design and size, and each is 55.5 centimetres long. The stocks, too, appear to be of nearly identical design. The most complete stock runs from the forward end to approximately 7 centimetres behind where the trigger entered. Remains of an iron hanging-loop are at the forward end, and iron cheek-plates are associated with the bow and the area of the trigger mechanism and nut. Wooden wedges at the forward surface of the bow, in tandem with sinew or cord bridles, secured it in the stock. It has a Z-shaped trigger that released a wooden or staghorn nut, the bow sockets canted forward to elevate the arms of the bow, and grooves running down the upper centreline of the oak stocks to help guide the bolt's flight. The Padre Island crossbows also had an interesting feature of a wooden wedge that set into the stock, behind and over the top of the firing end of the trigger, which apparently served as a safety mechanism to hold the trigger in place and prevent firing. Iron gaffles were also the preferred cocking device on the Padre Island sites. Considering similar design and identical proportions of the Padre Island crossbows, they look to have been a matched set made to the same standard. The Padre Island bows are also smaller than what have generally been recognized as military-type crossbows, and it has been hypothesized that they represent a previously unrecognized, smaller, lighter "marine" crossbow that was adequate for close-range, ship-to-ship fighting, but not unwieldy in close quarters (Arnold, Watson, and Keith, 1995:17).

More than any other crossbow component, metal crossbow bolt-points are associated with early Spanish colonial archaeological contexts, and these points are generally similar to the St. Johns examples. A survey of fifty-six points, almost all from sites associated with Juan Vasquez de Coronado's

1540-1542 expedition through the southwestern United States, revealed points ranging between 29.1 and 57.9 millimetres long, with four point-types: cone, solid-diamond, solid-triangle, and flat-triangle (Gagné, 2003: 246-247). Most interestingly, all of the bolt-points associated with the Coronado expedition are made of copper, a characteristic that is indicative of Mexican manufacture (Rhodes, 1997: 40-42; Gagné, 2003: 241). This use of copper was the result of two factors - a Spanish policy prohibiting the processing of iron in the American colonies and the exceptional ability of Native Mexican craftspeople work with copper. Hernan Cortes, in the 1520's, was the first to utilize copper crossbow points, and the tradition was apparently still in effect in 1540 (ibid.). And the tradition appears to have carried on later into the sixteenth century: four crossbow points recovered from the Emanuel Point I shipwreck – a vessel from Tristan de Luna's 1559 Florida colonization effort, and outfitted in Mexico – are all made of copper (Hunter, 1998: 147-150). Iron points very similar to the larger St. Johns piece are in the La Isabela (1490's) and Santa Elena (1566-1582) collections (Deagan and Crucent, 2002: 169; South, Skowronek, and Johnson, 1988: 100-107).

The presence of crossbows on the St. Johns ship is in line with a traditional use of the weapons in the Spanish colonial system, a tradition that has its roots in medieval Spain and which historical and archaeological evidence shows to have continued with some regularity up to ca. 1580. The collection of parts and pieces from the wreck shows the steel bows mounted on straight, slender wooden stocks reinforced by iron or bronze cheek-plates where the bow and stock met, and at the point of the firing mechanism. There is no decoration, and no makers' marks, on any of the cleaned pieces. The recovery of six gaffles from the wreck, and no evidence for any other type of cocking mechanism, shows that this was likely the sole method used for arming the St. Johns crossbows, which fits a pattern from other, similar Spanish colonial sites. The St. Johns bolt points were made of iron, not copper; evidence for a European, not Mexican, origin.

There are some characteristics of the St. Johns crossbows, though, that set them apart from others of the same era. First, the one existing cheek-plate covering the trigger and nut is made of a solid, rectangular plate of iron folded to fully cover the stock at this key point, whereas comparable bows have a plates made from narrower bands cut into a U-shape and then folded, which did not offer the same degree of protection or reinforcement. Some of the St. Johns cheek-plates at the bow are solid, too, and they covered a sleek, scalloped design at the forward end of the stock. In addition, there is no evidence of hanging-loops attached to any St. Johns stocks. The one nut from a St. Johns stock appears to have been made of iron or steel, thought to be characteristic of later, seventeenth century crossbows (Payne-

Gallwey, 1903: 96). This nut was set between two curved lead plates to hold it in place in the stock, a feature that is previously undescribed. Overall, the St. Johns bows are similar in proportion to other Spanish bows of the era, and used the same sort of cocking mechanism, but they also look to have some perhaps newer, more innovative elements than comparable crossbows from other shipwrecks and museum collections.



Figure 6.33. The six conserved steel bows recovered from the St. Johns shipwreck site.

Though the nine examples from the St. Johns wreck are, size wise, generally in line with other crossbows described as “sporting” types, there is variation in their design, and it certainly does not look like they were all made by the same maker (Fig. 6.33). The significance of the different types of bows is not clear; perhaps each type performed just differently enough that they filled different niches of firepower (an idea best tested by making functional reproductions). Considering their generally similar sizes, though, it does not seem that the firepower from bow to bow could have been radically different, and it appears more likely that availability is what determined this assemblage. It is easy to imagine a ship owner or crew pulling together, or pooling, whatever crossbows were available that could still perform as needed – a sort of willy-nilly collection of what was handy, but appropriate.

Once on the ship, the field evidence shows the crossbows were stored together with their folded and “closed” gaffles, in an area of the stern, most likely under the poop deck. This finding is in line with a document related to the 1559 de Luna fleet that describes a shipboard chest packed with a dozen crossbows, along with their quivers and accessories (Bratten, 2009: 112). And, the St. Johns crossbows were not only stored together, they were kept with other hand-held weapons such as pikes, bills, swords, and arquebuses. It is important to note, too, that with their slighter size, the crossbows would have taken less space, an important feature on a crowded ship, and one that agrees with the notion of a smaller, “marine” crossbow.

It is interesting to see from this shipwreck and other sites that the crossbow overlapped with the arquebus for many decades. Why did this ancient weapon persist in the face of a seemingly more modern and powerful firearm of similar purpose? Alonzo Martínez de Espinar offers perhaps the best

reasoning from the time for the continued desirability of the crossbow. Though he was writing from the perspective of a hunter, his arguments are also valid when considering the crossbow as a weapon or instrument of defence (1644: 12):

“The crossbow is safer for the life of a man than the harquebus, because the misfortune of death has not happened by breaking the stock or cord, which are the two dangerous things that [crossbows] have that tend to repeatedly fail; if any harm from them happens, it is nothing considerable. The crossbow is much better than the harquebus, stealthier, and in the hunt it kills not scares; it is smooth and quiet, if he who uses it is dexterous, something that you can't do with the harquebus, which with its loud noise frightens and scares the game, and wherever it is fired, it is subsequently noticed. Likewise, the crossbow is cleaner in its use and less costly.

[The crossbow] is more efficient, and once charged, it never fails to shoot, [leaving] its owner wanting to fire. The opposite often happens with the harquebus, and sometimes dangerously for the shooter; he was going to accomplish something with it, [but] by its deficiency it misfires and he is not able to reach his goal, despite having declared the intent, by which there have been very large misfortunes. Also the crossbow kills all kinds of game, large and small, and it fires different projectiles, with which it can reach a hundred and fifty and more paces”.

Simply put, the crossbow offered advantages that the harquebus did not: it was reliable, safe, and easy to use, it would fire in any weather, it was easy to charge and have at the ready well before action, it did not draw attention when fired, and it was effective. All of these are qualities that would have been desirable, whether on board a ship or on land. Clearly, through nine preserved examples, we see the crossbow was an important weapon for those on board the St. Johns wreck, and that they considered it effective for the situations they expected to encounter.

Chapter 7: POLE-ARMS

Among the collection of objects recovered from the St. John's Wreck are two types of pole-arms, the bill and the pike. Pole-arms are weapons made of stone or metal mounted on shafts or poles, with the functions of cutting, thrusting, and percussion, or combinations of the three (Snook, 1998: 1). The relatively long shaft of the pole arm gave the user a measure of distance and safety from an opponent, while sometimes also allowing greater leverage for more forceful swinging, chopping, or cutting. Pole-arms clearly played a role in the Spanish conquest of the Americas. Hernan Cortes described the use of pole-arms by both Spaniards and Natives: Native Mexicans against horses (1520 [1866]: 153), by Spanish foot soldiers against Indian foes (1522 [1866]: 246), and in Spanish-on-Spanish violence (1526 [1866]: 385-386). Pole-arms were similarly used in the conquest of sixteenth-century Peru (Fig. 7.1). Other Spanish expeditions to the Americas also carried such weapons, including Hernando de Soto's exploration of Florida, which utilized halberds in its arsenal (Dougherty, 2010: 17).

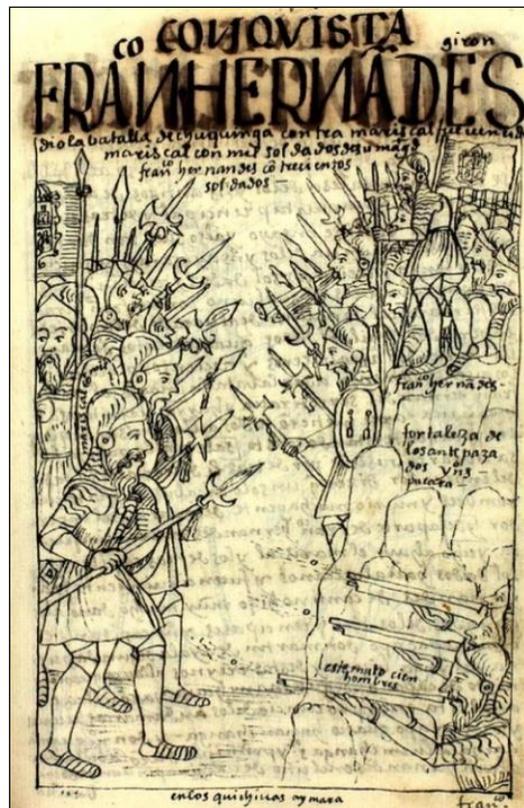


Figure 7.1. Spanish combatants clashing with a variety of pole arms (and harquebuses) in mid sixteenth century Peru. (Guaman Poma, "FRAN^{CO} HERNANDES Girón dio la batalla de Chuquina contra mariscal." 1615: f.430).

In the regulations outlining their armaments, pole arms, specifically pikes and lances, were standard for all Spanish Indies ships in the last two-thirds of the sixteenth century (Carlos II, 1681: F45R-46R). Interestingly, King Philip II made an amendment to the requirements for staff weapons on board ships and gave an indicator of what styles were more desirable: “because the thin lances and half-pikes [*chuzos y media picas*] are not so helpful as they should be, halberds and lances [*alabardas y lanzas*] from Vizcaya can be exchanged for them, getting [them] so that there are more halberds. And so for all types, the large ships carry two dozen, and the smaller one and a half dozen, and the smallest a dozen.” (Philip II, 1581 [1841]).

Bills

There are five examples of bills (*bisarma* in Spanish) from the wreck. These are a type of pole-arm with a broad iron head that features concave, recurved cutting edges and points protruding forward and back. There can be confusion between the various types of pole arms, as there is overlap in both function and design. The confusion can be especially strong between halberds and bills. In fact, some sixteenth-century writers considered their differences inconsequential: “there is but a small difference in the Javelin, And the Bill, and the Holberd, are in a maner all one, and the verie selfe same,” wrote Giacomo DiGrassi (1594: f. P3r-P3v). But differences are seen, and, in simplest terms, the halberd is derived from the axe, and the bill is rooted in agricultural implements and woodsman’s tools known as “billhooks” (Snook, 1998: 2; 18-19) (Fig. 7.2). Billhooks, though not as common as the axe, are still utilized in modern times for cutting small trees and brush (Salaman, 1980: 74-75).



Figure 7.2. Cutting grape vines with a billhook. (Detail from Simone Martini’s Illuminated title page of Petrarch’s *Virgil*, ca.1336, Biblioteca Ambrosiana, Milan).

Bills are distinguished from other pole-arms by a hooked, crescent-shaped blade (Waldman, 2005: 115). They generally bear an elongated, forward-looking point and a spike opposite the hooked cutting edge. Bills as weapons are found in Spanish artworks dating to the middle of the fourteenth century (Bruhn de Hoffmeyer, 1982: 210).

As with many iron artefacts from the St. Johns shipwreck, the heads of the bills have survived only as rust encased by marine encrustation and had to be cast of epoxy resin to recover their original form. The casts show that, though they are all from the same style of weapon, each bill corroded differently in the centuries-long submersion, leaving varying, partial pieces. Fortunately, one example did survive as a complete bill-head.



Figure 7.3. Bill 92-1230. The only intact example from the wreck.

Bill 92-1230 is the only intact example of this type of weapon recovered from the St. Johns wreck, and it serves as the model by which to understand the others (Fig. 7.3). This bill is 60 cm long, and has a tapered, 12.9-centimetre-long socket designed for a staff of 4.7centimeters in diameter. The agricultural, utilitarian origins are evident in the design, but this is clearly a device that has been adapted for combat. A hooked cutting edge runs along the bottom of the blade, distinctive of the billhook. But the blade is bifurcated toward the point, with the lower lobe forming the hook of the cutting edge, and the upper lobe leading into an elongated, quadrangular spike. Along the spine of the blade, at 29.3 centimetres from the bottom of the shaft socket, is a “back-spike” which is 4.2 centimetres long and finished as a quadrangular point. A scar at 6.8 centimetres from the base appears to mark where a fastener once helped fix the iron head to the shaft.



Figure 7.4. Bill 92-0859.

Bill 92-0859 is a 44.5-centimetre-long piece consisting of a broad blade with the lower cutting edge and shaft socket (Fig. 7.4). The hook of the cutting edge does not appear to curve as tightly as in other examples from the wreck. The fore-spike and back-spike have been corroded away, though the weld-scar from the back spike is still present along the spine of the blade. The socket opening is 3.85 centimetres in diameter. A hole is pierced in the shaft socket, 7.7 centimetres from the base, apparently for a fastener to hold the bill to its shaft.



Figure 7.5. Bill 92-1231.

Bill 92-1231 is also badly corroded, but much of the blade remains (Fig. 7.5). It has a lower cutting edge, and the beginning of the bifurcation is present, but both the hook and fore-spike are gone. The weld-scar from a back-spike is found on the blade spine, 25 centimetres from the base of the shaft socket. The socket runs for 16.2 centimetres, where it then blends into the blade; fragments of the shaft's wood are found within. A headless rivet that once helped attach the wooden shaft is found 7.7 centimetres from the bottom of the socket. The opening of the socket is 4.1 centimetres.



Figure 7.6. Bill 96-2040.

Bill 96-2040 is a 27.8 centimetre section running from the shaft socket to the front edge of the back-spike (Fig. 7.6). The opening of the socket is 4.5 centimetres. The back-spike is 2.5 centimetres wide and 7.4 long; it is finished with a quadrangular point.



Figure 7.7. Bill 96-2107.

Bill 96-2107 is the top, forward portion of a bill blade (Fig. 7.7). It bears a 5.3-centimetre-long back-spike that terminates in a quadrangular point, and a long forward spike that is also finished similarly.



Figure 7.8. Bill 96-2108.

Bill 96-2108 is essentially a shaft socket, with only a small fragment of the flat blade remaining (Fig. 7.8). It was fastened to the shaft by a square-shanked, iron rivet with a T-shaped head. This shaft socket was almost certainly part of the same bill as fragment 96-2107, as they were found directly next to each other on the sea floor.

The remains of the St. Johns bills show very clearly how the iron heads were mounted and fastened to the wooden shafts (Fig. 7.9). The socket of the head slid over a tapered end of the shaft and fit tightly on it. Two iron rivets then fixed the bill to its shaft. In all of the examples, the rivet nearest the point was T-shaped, and the elongated head bridged across the open throat of the socket preventing the rivet from pulling through the wood. The sockets range between 14 and 16 centimetres deep. None of the St. Johns bills show any sign of having had longer, iron-strap langets attached to them to further reinforce the shaft in the span immediately below the head. The type of wood used for the shafts is not known, as what remains is of insufficient quantity and too poorly preserved to sample for species identification.



Figure 7.9. Three detail-views of the shaft socket from bill 96-2040.

Two of these bills bear a stamped mark of a cross set in a circle (Fig. 7.10). Though this mark is not traceable to a specific manufacturer, it does fit generally into the style of mark seen on other Spanish pole-arms from the sixteenth century (Hawtrey Gyngell, 1959: 79).



Figure 7.10. Maker's mark of a stamped cross within a circle from St. Johns wreck bill-head #92-0859.

Other archaeological examples of bills include 121 found on the 1545 English shipwreck *Mary Rose* (along with 21 pikes) (Hildred, 2005: 171), and one example from an early seventeenth century context at the colonial settlement of Jamestown, Virginia (Cotter & Hudson, 1957:69).

Pike



Figure 7.11. Resin cast of Pike Head 93-1322 recovered from the St. Johns Bahamas wreck. (Photo: Dylan Kibler/MFMHS)

The boarding pike is called *pica* or *chuzo de abordaje* in Spanish (Cañada y Gisbert, 1878: 36). These weapons are almost certainly derived from the pikes utilized by the land-based Spanish *tercios*; infantry soldiers armed with long pikes mounted on shafts from 4 to 5 meters long who marched in concert with arquebusiers (Glete, 2002:79; Jörgensen, et al, 2005: 13-15). *Pedro Menéndez de Avilés* referred to the pikes being used on board ships in a letter to King Philip II, advising him of the preparations of a Spanish

fleet, and his note gives some insight into the use and preferences for this weapon. Menéndez said, “Of the long pikes, they cut them at the middle and make half-pikes, and they cost twice as much as those to be found in Cádiz, and they are not so good by coming to be made shorter” (ca.1560, in Ruidíaz, 1893: 319). This statement implies that the ships’ pikes in this instance were indeed being adapted from longer field pikes, whose shafts were literally being cut in two to make “half-pikes.”

The pike head from the St. Johns wreck was also completely corroded and had to be cast of resin from its marine concretion mould. The pike is of a “leaf” design and has symmetrical, sharp edges that run down each side before coming to a point at the tip of the head (Fig. 7.11). A central spine, running from the base to the tip on both faces, reinforces the iron head to prevent it from bending. The piece is 17.3 cm long and 4.25 centimetres at its widest. The shaft-socket at the base extends downward one centimetre from the body (this does not appear to be its full length) and is 1.7 centimetres in diameter. There is no evidence of langets.

Similarly-proportioned pikes have been recovered from the wreck of the Spanish galleon *Nuestra Señora de Atocha* of 1622. The *Atocha* pikes are much larger, though, at 28 centimetres long by 9 centimetres wide; nearly twice the size of the St. Johns examples. That the distinctions “pike” and “half-pike” might also bear a relationship to the sizes of the heads, as well as the length of the shafts, seems reasonable but is not known for sure.

The Use of Pole Arms on the Ship

Treatises on the use of edged weapons written near the end of the sixteenth century contain considerable detail on the particulars of bills and their use. Giacomo DiGrassi offers some specifics on the employment of the bill, “In the handling of this weapon...no more than one ward, being the hands, for the more suretie in the middle of the staff. And that ward must be the lowe ward. The hands must be somewhat distant, one from another, and the point of the weapon directlie toward the enemie...” (1594: f.P7). Writing at nearly the same time, George Silver describes two types of bill: a medium weight “forest bill,” and a heavier “black bill.” He very much favours the forest bill, and says flat out, in respect to one-on-one combat against other edged weapons, “The Welch [Welsh] hook or forest bill have advantage against all manner of weapons whatsoever” (Silver, 1599:31). The reason for this endorsement was the broad, multi-use head as well as a staff of “perfect length.” These qualities allowed the weapon to be useful from a variety of stances and positions, and the head, with its blade, barbs and hook, could cut and stab, or pull an opponent off balance.

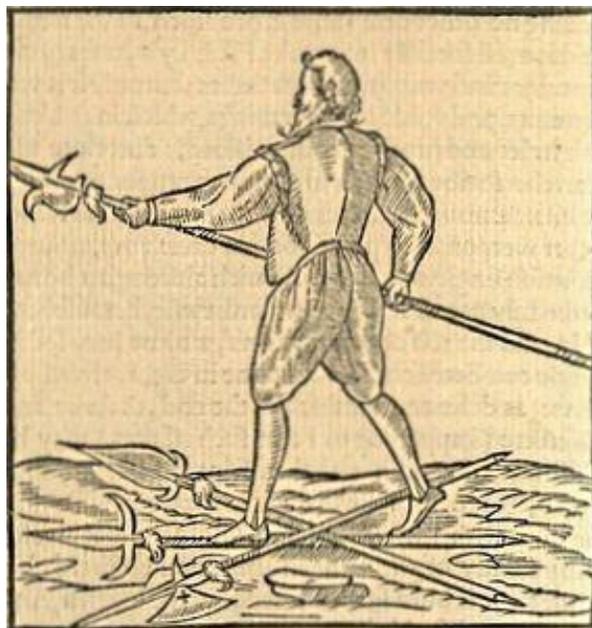


Figure 7.12. A man holding a bill, with other pole-arms at his feet. (From Di Grassi, 1594: f.P6).

Silver notes that the average staff length for pole-arms was between 8 and 9 feet; a figure determined by the user placing his hands as high on the staff as possible, and then adding another two hand-widths beyond. To quote Silver: “To know the perfect length of your short staff, or half pike, forest bill, partisan, or glaive, or such like weapons of vantage and perfect lengths, you shall stand upright, holding the staff upright close by your body, with your left hand, reaching with your right hand your staff as high as you can, and then allow to that length a space to set both your hands, when you come to fight, wherein you may conveniently strike, thrust, and ward, & that is the just length to be made according to your stature. And this note, that these lengths will commonly fall out to be eight or nine foot long...” (1599: 29). This made the staff long enough to offer some distance between the opponents, but did not make it too heavy or too flexible. The staff itself could also be used for offence or defence, to strike or trip one’s enemy, or block incoming blows.

As for the pike, Di Grassi wrote “So among the weapons of the Staffe, the Pike is the most plaine, most honourable, and most noble weapon of all the rest” (1594: f.Q2). The pike, though of simple design, required great strength and a nimble mind to use it effectively in the many ways that it offered.

Despite whatever idealism both Di Grassi and George Silver felt for these devices, it would seem that such weapons on board a ship would have been problematic on board ship because of the limited deck spaces and all the ropes and rigging to get in the way. García de Palacio offered the following advice in

his sixteenth-century ship-handling treatise on the use of pikes on Spanish ships, “And at all the sides pikes will be had, and half pikes, from port to starboard, the points fronting the loopholes, because for any time of need they are at hand to harm those who want to climb on board...” (1587: 322-323). Later, García again refers to the use of pole-arms, saying that the ship’s defenders “must be in the upper deck of the Stern, with the arms that have been said, and with some broadswords and halberds...” (ibid: 342). Rather than for use in hand-to-hand combat on deck, pole arms were intended to repel boarders before they found their way onto the ship. Pole-arms would also have been useful weapons for excursions ashore. Large numbers of pole-arms – 10,000 pikes, 1000 halberds, and 6000 half pikes - were ordered for both purposes for the Spanish armada that invaded England in 1588 (Fernandez Duro, 1885: 82).

The pole-arms discovered on the St. Johns wreck – five bills and one pike – were a standard part of the sixteenth-century arsenal. The two types of weapon are those frequently mentioned in the writings of the times. Though the term halberd [*alabarda*] is most commonly used in the early writings, it is clear that at the time there was little differentiation between that weapon and the bills found on the shipwreck. Because the wooden staffs for these weapons did not survive, their length is not known. For the bills, it would appear that somewhere around 8 feet (2.5 meters) would have been likely. As for the recovered pike head, its shaft length could vary considerably, between 8 to 16 feet (2.5 – 5.0 meters), depending on whether it was a pike or half-pike; the relatively small head suggests it might have been a half-pike.

The St. Johns pole-arms were all found clustered in the upper stern area of the vessel, alongside other hand-held weapons, once again reinforcing the idea that the ship’s arms were held in storage, to be distributed when needed. These particular pieces look to have been on board the ship to repel any enemy trying to climb aboard by stabbing, cutting, and thrusting at them from a relatively safe distance. With at least six of the staff weapons, they could have been used to defend ship from multiple stations, and anyone who tried to come aboard a ship armed with such weapons would have faced tremendous resistance.

Chapter 8: SWORDS AND DAGGERS

The Spanish *espada ropera* (dress sword), known more commonly in English by the shortened sound-alike “rapier,” was characterized by a long, narrow blade that was designed less for cutting and more for thrusting (Pelaez Valle, 1983: 147). This type of sword was carried as weapon and as attire, alike, in a heyday from the mid sixteenth through the seventeenth centuries. In Spanish colonial culture, the sword loomed large, and it was an essential tool in the colonization of the Americas. From the Native American perspective, the Inca historian Guaman Poma, in his illustrated account of the Peruvian conquest, depicted many Spaniards with swords. But perhaps none is more expressive of his perception of the era than his illustration of St. James the Greater, the Patron Saint of Spain, trampling an Inca lord with his horse while proudly holding a sword aloft in right hand (Fig. 8.1a). Another early, colonial-era print summarizes the power of the sword in the Spanish consciousness – it depicts an armoured gentleman gripping the hilt of his sword while holding a compass over a globe turned to the Americas; below him are the words “A la espada y el compas, mas y mas y mas y mas [By the sword and the compass, more and more and more and more]” (Fig. 8.1b). Both of these images clearly use the sword as a metaphor for the force that was essential to Spanish explorers and colonists in their expansive vision for the exploration and subjugation of the New World.



Figures 8.1 (L) Miracle of St. James the Greater, Apostle of Christ, intervening in the war at Cusco. (Guaman Poma 1615, f.406); (R) “A la espada y el compas, mas y mas y mas y mas.” (Frontispiece from Bernardo de Vargas Machuca *Milicia y Descripción de Las Indias*, 1599, John Carter Brown Library, Brown University).

It is perhaps little surprise then that the St. Johns wreck has yielded evidence of multiple swords and daggers, and these pieces give an understanding as to what types of these important weapons were utilized on board a Spanish colonial ship in the mid to late sixteenth century.

The Hilts



Figure 8.2. Sketch of a sword with a simple cross-bar guard; the user's index finger is over the bar and onto the ricasso of the blade and covered by a single arm for protection. (Detail from Francisco Rizi (1614-1689), *Degollación de San Juan Bautista*, n.d., Biblioteca Nacional de España).

The swords of the St. Johns wreck, and those of sixteenth century generally, were developed from heavy, broader-bladed swords with long grips that could be held with two hands and which were used primarily for cutting, to a lighter, narrower, sharp-pointed blade mounted on a one-handed grip that was designed for thrusting; a transition that occurred through the fourteenth and fifteenth centuries (Bruhn de Hoffmeyer, 1963: 25-35; North, 1982: 5-9). With the change in blade and fighting style came a change in the design of the hilt. Earlier, there had been a long-running practice for a swordsman to hook an armored forefinger over a simple crossbar guard and against the edge of the blade. As hand armor fell out of favor, the ricasso, a blunted section of the blade nearest the guard and grip, was developed to prevent the unprotected finger from being cut, and starting in the 1430's, arms, or "*pas d'anes*," that curved from the crossbar to the leading edge of the ricasso, came into use to offer the exposed finger even greater protection; this was often complemented by a knuckle-guard, a bar arcing from the crossbar to the pommel, to provide protection for the other fingers and back of the hand (Oakeshott, 1960:327-329) (Fig. 8.2). In the sixteenth century, the knuckle-guard, or "counterguard," became more elaborate, with a variety of bars and loops joining with the quillons of the crossbar and the arms to offer

even more protection for the hand (Burton, 1884: 124-126) (Fig. 8.3). Versions of this sort of more-elaborate hilt are what are seen on the St. Johns swords.

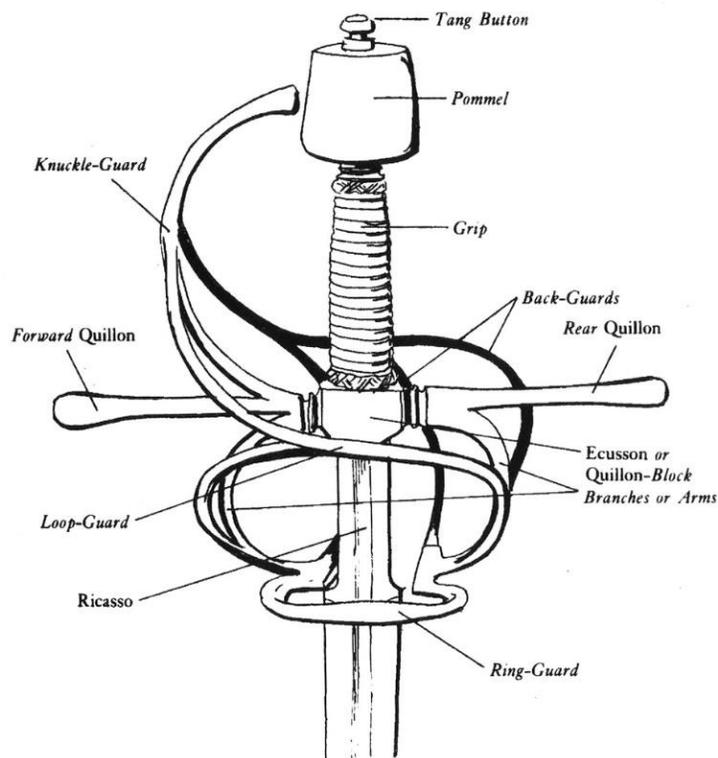


Figure 8.3. Nomenclature of Sword Hilt Parts. (Oakeshott, 1980: 128, Figure 53).

Rapier Hilt 92-0290

St. Johns hilt 92-0290 is cast from the marine concretion that formed around it while it was underwater, as the iron and steel of the sword had completely deteriorated (Fig. 8.4). The resulting detailed cast is essentially the same form as the original, and much of the hilt and a significant section of the blade were recovered through the process. Also, small portions of wood from the grip and sheath survived and are attached to the resin cast.

The remaining sword has an overall length of 45.6 centimeters: a pommel 5.3 centimeters long and 4.5 centimeters in diameter, a wire-bound, wooden grip 7.5 centimeters long, and a portion of a blade 32.8 centimeters long and 3.0 centimeters wide from the grip/quillon-block interface. A fuller 0.9 centimeters wide runs the length of both sides of the 0.6-centimeter-thick blade. Of the hilt, the forward quillon, quillon block, and a short section of the rear quillon, along with a full ring-guard, two small protrusions projecting from the quillon-block that remain from the base of a second ring-guard, and a small portion

of a knuckle-guard, have survived. There is some chiseling on the quillon-block and the arms as decoration. A thin veneer of wood covers one side of the blade at the ricasso, apparently the remains of the sword's sheath.

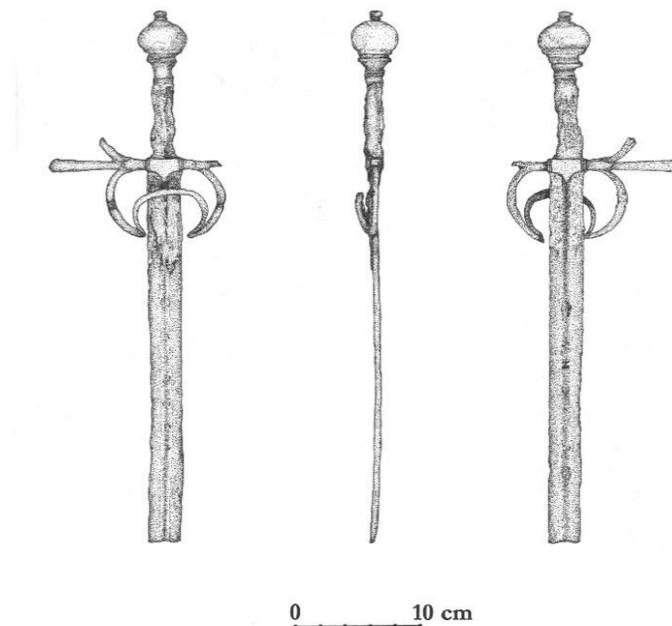


Figure 8.4. Rapier hilt 92-0290 three views. (Drawing: Kris Keeling/MFMHS).

Enough of the hilt survives to understand its original design and to compare it to other swords. It matches closely with hilt no. 46 in Norman's exhaustive catalogue of swords and rapiers, a style that dates to between 1525 and 1640 (Norman, 1980: 117). A survey of Spanish swords dates the hilt's style more specifically to the middle third of the sixteenth century (Pélaez Valle, 1983: 154-155, Fig.K). Another similar example is found in the Victoria and Albert Museum, though it is much more highly-decorated than the St. Johns specimen and bears short back guards from the quillions to the base of the ring-guard; the blade is marked "FRANCISCO RUIZ EN TOLEDO" and the sword is thought to date to ca. 1590 (North, 1982: 12, plate 16). The Italian artist and designer Filippo Ursoni conceived of a sword hilt quite similar to St. Johns 92-0293 in his mid sixteenth-century sketchbook of ideas for swords, armour, and other equipment (Ursoni, 1554: plate 82) (Fig.8.6). The pommel of 92-0290 is of an unusual design that matches closely with a style (no. 72) described as resembling a "tureen-lid" by Norman that dates from 1530-1565 (1980: 271).

Perhaps most significant to understanding the origins of this sword are block-letter inscriptions running down the blade fullers: on one side it shows "ANDRES," and down the other reads "GARCÍA," each

framed by oval-shaped designs at either end (Fig. 8.5). Clearly these are names, and it was thought initially that, combined, they might be the full name of the sword's owner. But research shows they are more likely the maker's "signature."

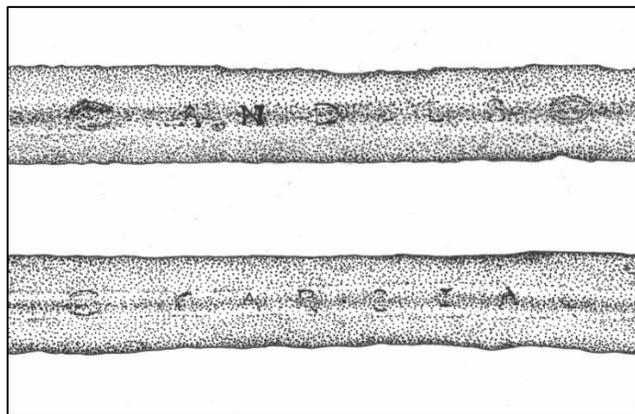


Figure 8.5. Detail of "ANDRES" and "GARCIA" marks down either side of blade 92-0290. (Drawing: Kris Keeling/MFMHS).

An Andres García was a well-known swordsmith working in Toledo during an unspecified period in the sixteenth century, and his mark is recorded as a crowned-G stamped within a shield (Fernández de Córdoba, 1854:115; Leguina, 1897:97; Dueñas Beraiz, 2003). The eighteenth century travel writer John Talbot Dillon included Andres García in a list of bygone but famed Toledo swordsmiths, and said, "Any old blades found with these last names, may undoubtedly be considered as true Toledos, and executed by the most capital artists" (1781:146-147). It would appear that the stamped signature that St. Johns blade 92-0290 is likely a maker's mark, and the sword is the handiwork of the well-regarded sixteenth-century Spanish swordsmith Andres García.

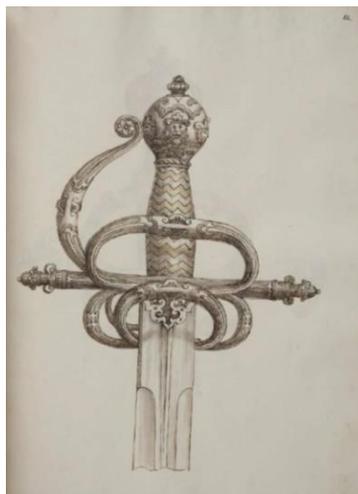


Figure 8.6. A sword hilt of similar design to St. Johns hilt 92-290. From Filippo Ursoni (1554, plate 82).

Rapier 92-0833

Sword 92-0833 is the most complete example found on the site. It was found in two parts, with the first being a hilt, handle, pommel, and partial blade cast from the calcareous concretion that formed around the completely corroded original. The quillons of the hilt are 15.0 centimetres, tip-to-tip (though their ends are broken and the original span is unknown); the handle is 6.7 centimetres long; and the pommel is 6.0 centimetres long and has a diameter of 4.2 centimetres. The elaborately-shaped guard was fashioned from plain, unchiselled bar-stock. The carved wooden grip was bound with fine, braided wire.

An 80 centimetre portion of a blade, independent of its hilt, was found sticking out from under the eastern edge of the hull planking. The blade itself had completely corroded. In the lab, through examination of the impressions left in the marine encrustation it was learned that it is the counterpart to hilt 92-0833, so the two pieces were re-joined to create a nearly-intact piece (Fig. 8.7). The blade is 3.0 centimetres at the widest and has a maximum thickness of 0.55 centimetres. The ricasso is 4.0 centimetres long, and the 1.2-centimeter-wide fuller continues from the base and runs nearly the length of the blade, though it narrows and becomes slightly shallower as it advances towards the tip. Rapier 92-0833 has an overall length of 109 centimetres; the blade, alone, measures 96 centimetres, from the quillon/grip interface to the tip.

Hilts of a similar design are recorded in various arms surveys. Norman notes two closely-related styles: one that dates from ca. 1545 – 1620 (1980:146, No.74) and another with examples known to the 1585 – 1620 period (1980: 149, No.75). Pelaez Valle dates this style to the middle third of the sixteenth century (1983: 155, Fig. O). And Oakeshott illustrates an example of a “full-hilt” that he dates more generically to the sixteenth century (1980: 140, Fig. 58, D²). Another hilt of strikingly similar design is found on what is thought to be a costume sword dated to ca. 1600 (Wagner, 1975:73). Norman offers further dates for other components of the sword: The somewhat unusual teardrop, or onion-bulb, pommel is found on other examples dating to between 1550-1585 (1980: 272, no.73), and the inner guard is a design seen on swords dating from the 1530’s to 1630’s (1980: 221-222, no.9). All in all, looking at all of the comparable dates, this combination of hilt and pommel designs dates solidly to the middle-late 1500’s.



Figure 8.7. St. Johns Rapier 92-0833, three views.

Similarly-designed swords are found in artworks of the era, perhaps most strikingly in a ca. 1570's portrait of an unknown soldier by Bartolomeo Passarotti that depicts a hilt that matches almost exactly with St. Johns hilt 92-0833 (Fig. 8.8). The hilt in the painting has full-length quillons and looks to have been gilded, but the design of the guards is virtually identical.



Figure 8.8. *Soldier in Armour* (Bartolomeo Passarotti ca. 1575-1580. Address House, UK National Trust).

Two marks were stamped into the blade. One is a small, gold-inlaid design some 6 millimetres long that looks like an X, a knotted ribbon, or a flying insect (Fig. 8.9). The maker associated with this mark is not known, but identical examples are found on two pieces on the Tower of London collection; one is on the blade of a *cinquedeas* dating to the middle of the sixteenth century, and the other is on the blade of a broadsword of the same period (Ffoulkes, 1915:180; 183). Another example is found on a sword in the *Real Armería* of Madrid, and it is dated to the first-half of the sixteenth century (Conde Viudo De Valencia De Don Juan, 1898:221).



Figure 8.9. Small stamped mark on blade 92-0833

Another mark on the blade is a “running-wolf,” or “*perrillo*.” The wolf mark was first used by swordsmiths in the German city of Passau, where the wolf was a symbol of the city. It was appropriated as a mark of quality by blade-makers in nearby Solingen, and later by swordsmiths in England and across Western Europe (Clephan, 1900: 171-172). The wolf was adapted by swordsmiths in Spain as a mark of quality, first in the fourteenth century by the armourer Julian Del Rey, and continued in a tradition that reached its zenith in the sixteenth and early seventeenth centuries (Rodriguez Lorente, 1964). In the Spanish tradition, the wolf became known as a *perrillo* (little dog). Rodriguez notes that the *perrillo* mark is generally seen with other marks on the blades of Spanish rapiers, while on German blades they usually appear alone (ibid.). In its time, the *perrillo* mark indicated a blade of quality, a point that was noted even by the writer Miguel de Cervantes when he described his character Don Quixote going to battle with a lion: “You on foot, you alone, intrepid you, magnanimous you, with only a sword, and not one of those good-cutting ones of the little dog [*Tu a pie, tu solo, tu intrépido, tu magnánimo, con sola una espada, y no de las del Perrillo cortadoras*] (Cervantes, 1605 (1671): 142).”

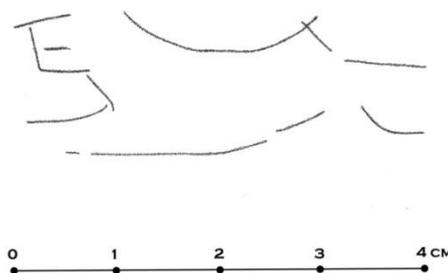


Figure 8.10. Running-wolf or *perrillo* mark on blade 92-0833

A swept-hilt rapier with plainly-designed hilt “of mediocre make” bearing the same two marks as St. Johns 92-0833 is found in the Wallace Collection (No. A577). The piece is thought to be German, made at Solingen around 1600 (Mann, 1962: 293-294).

In general, the long, pointed blade of the *espada ropera* was especially effective because it allowed for an offensive thrust to be made from a safe distance (Clements, 1997:6-7). But a user had to consider his stature when choosing an appropriately-sized sword. George Silver, writing at the end of the 1500’s, offered a solution for determining the ideal length: “To know the perfect length of your sword, you shall stand with your sword and dagger drawn, as you see this picture, keeping out straight your dagger arm, drawing back your sword as far as conveniently you can, not opening the elbow joint of your sword arm, and look what you can draw within your dagger, that is the just length of your sword, to be made according to your own stature” (1599: 28) (Fig. 8.11).



Figure 8.11. Illustration of George Silver’s formula for determining ideal sword length (1599: 28).

Rules of thumb like Silver’s were not always followed, though. In the middle decades of the 1500’s, exceptionally long swords were apparently becoming a problem in the Spanish colonies. So much so, that an edict on the length of blades was issued by King Philip II to regional governors across the Americas in 1564, and his mandate offers an indication of the size of swords in the middle part of the sixteenth century. It reads: “We have been informed that in the said cities, villas, and places that there are carried some swords, *verdugos*, and estocs of more than six and seven and eight and nine *palmas*⁹ and above in length from which are caused many bad situations and deaths of men, and wanting to provide a remedy for this...we order and mandate that now and from here forward, having passed fifteen days from the day of the publication of this, our letter, no person of any quality or condition that he might be will dare to carry, nor will carry said swords, *verdugos*, nor estocs of a blade of more than

⁹ One *palmo* = 20.873 centimetres (8.2177 inches)

five fourths of a *vara*¹⁰ (Philip II, 1564b). The 96-centimeter-long St. Johns piece means the blade is 1.05 *varas* when measured from quillon block to tip; long, but a reasonable length in the eyes of the crown.

Pommel

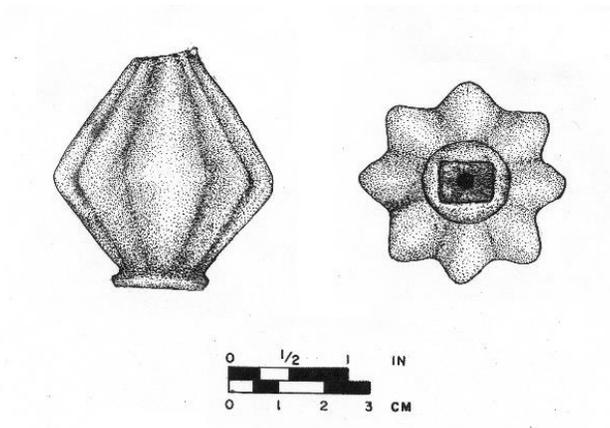


Figure 8.12. Pommel 92-1193. (Drawing Robert Cummings/MFMHS)

An iron pommel was found alone, without any other associated parts. It has eight projecting ribs on a form that bulges sharply at the centre with straight tapers toward the ends (Fig. 8.12). The pommel is 4.5 centimetres tall and 4.2 centimetres in diameter. The pommel's style matches closely with a type of pommel described by Norman as type 49, dating from ca. 1535 to 1570 (1980: 261).

Dagger Crossbar



Figure 8.13. Dagger Crossbar 93-1419. (Photo: Dylan Kibler/MFMHS)

In Western cultures, daggers were carried in tandem with swords primarily from the later sixteenth century through the early seventeenth, though the Spanish continued the tradition for roughly another one hundred years (Hayward, 1963:1). Daggers were commonly used to complement the sword in a duel, and they were held in the left hand for parrying (Pélaez Valle, 1983: 148; Swetnam, 1617: 86) (Fig. 8.13). A small, 10 centimetres wide cross bar consisting of a quillon-block with lobe-ended arms, all cast

¹⁰ One *vara* = 0.835905 meters; 5/4 *vara* = 1.003 meters

of resin from marine encrustation, is all that survives of what was a dagger or similarly-styled weapon. Similar quillions on dagger-type blades are described as a “kidney dagger” crossbar, dating across the sixteenth century (Tarrasuk, 1978:41, Fig. 18). Two daggers with crossbars of similar style and dimensions are found in the *Armería Real* in Madrid; both examples date to the sixteenth century (Conde Viudo De Valencia De Don Juan, 1898:247). There is a chance that this crossbar could have matched with pommel 92-1193.



Figure 8.14. “The true guard for the defence, either of blowe, or thrust, with Rapier and Dagger, or Sword and Dagger.” (From Swetnam, 1617:86).

Other Shipwrecks

For reasons that are not entirely clear, perhaps simply poor preservation in the marine environment or that they were prized possessions that were preferentially saved by survivors, there have been relatively few swords found on other sixteenth-century Spanish Indies shipwrecks. Two fragments of blades and their encrustation were found on one of the 1554 fleet shipwrecks (Olds, 1976: 98-99). When the encrustation was removed from one, it showed a series of five letters – N I M U, and two uprights from an H or N – had been stamped on the 2.3-centimeter-wide blade. The second blade fragment was 2.3 centimetres wide, with an elongated, diamond-shaped cross-section, and it had an impression of fabric that was perhaps the remnant of a scabbard. Another piece, a damaged hilt, was found by a collector in the spoil of the dredged site *Santa Maria de Yciar*, and though it was in poor condition, radiographic analysis revealed key details (Arnold and Godwin, 1990). Parts of the hilt, grip, pommel, and a very small portion of the blade survived. The 2-centimeter-long fragment of the ricasso of the blade was 2.3 centimetres wide and 0.5 centimetres thick. The 6.4-centimeter-long wooden grip showed evidence of both a cloth and wire wrap. Two quillions extend from either side of a quillon block, and a knuckle guard curves toward the pommel. The iron pommel, which was reconstructed for exhibition, was 4.6 centimetres, both tall and in diameter (Arnold, 1992). The restoration shows that it was intricately

chiselled with a design of braided leaves that resemble a turban and matches styles dating to the 1540's. It is unclear if the 1554 hilt was for a sword or dagger.

On the Molasses Reef Wreck, Keith describes three wrought-iron "finials" that appear to be sword or dagger pommels (1987:272-274). Two were poorly-preserved, but the third, an epoxy cast made from the original iron's marine concretion, shows an oblong form, 5.1 centimetres tall by 4.1 centimetres diameter, with four chiselled, rosette inlays surrounded by braided patterns, one set at each quadrant. The apparent pommel's form is a variant of a style described by Norman as dating to ca. 1530-1550 (1980: 261-262, no.49).

Swords on Indies Ships

Swords are not found on the lists of arms required to be carried by Indies ships (Carlos II, 1681: F45R-46R). But, despite perhaps not being royally-mandated, other historical evidence suggests swords were still obligatory on ships sailing from Spain to the Indies near the middle of the 1500's: Lists of arms and artillery carried on board frequently conclude with the phrase (or some closely-worded variation), "Each mariner brings his sword and buckler, which is obtained with his salary, and if he does not have it, the master buys it at his cost" (Casa de Contratación, 1530; 1542; 1545a; 1545b; 1545c). García de Palacio lists swords and daggers alongside firearms, a helmet and breastplate, and a shield as necessary for a shipboard soldier (ideally a mariner in the role of soldier), "so coming to blows he may attack and defend himself (García de Palacio, 1587: 334). So swords were largely provided by mariners, and, presumably, passengers would have carried their own, too. There is no known account of how swords were treated on board ship outside of combat, but all of the St. Johns pieces were found intermingled amongst the other hand-held weapons, and they look like they too were held in an "arms locker;" stowed until needed.

The St. Johns wreck's swords are examples of the Spanish *espada ropera*, and they compare favorably to designs that were used in the mid to late sixteenth century. The swords look to have utilized mid-grade to high-quality Toledo blades mounted on hilts that were fashionable but not ostentatious with little chiselling and no gilding. The one complete blade was long (but not overly so according to law) and would have been effective for thrusting. Both swords had double-edged blades, and they would have cut, too. Exactly who the St. Johns swords belonged to – crew, passengers, or the ship's owner – is not known, but, to whoever held them, they would have been useful in hand-to-hand combat, whether offensively or defensively, on land or at sea.

Chapter 9: ARMOUR

Four pieces of iron or steel plate armour have been recovered from the St. Johns wreck – the remains of two helmets and fragments of two breastplates. All were completely corroded and their forms were recovered by casting them of epoxy resin, utilizing the calcareous marine encrustation mould that had formed around them while underwater. None of the St. Johns armour is decorated in any way: It is all simply plain, hammered plate. Function looks to have been the priority for these pieces, and they were not worn for any particular show.



Figure 9.1. St. Johns Helmet 91-0031, side view (L) and front view (R). (Photo: Dylan Kibler: MFMHS).

Helmets

One of the iron helmets is the largest piece of this protective gear to be discovered on the site (Fig. 9.1). Approximately 60% of it survived. The helmet was made of one piece of 2.6-millimetre-thick iron plate hammered into shape. The remains show a bowl-shaped, open-style helmet, with a low comb running fore and aft along the crown. At the peak, the comb is 2.8 centimetres wide and 2.4 centimetres tall. A down-turned brim, 2.6 centimetres wide, runs around the base. The helmet is 20.2 centimetres tall, and 26.0 centimetres from front to back at the brim edges; it is 21.0 centimetres from front to back at the bowl edges. Two rivets are found just above the brim; they are set at 2.8 centimetres apart and are nicely finished and nearly flush with the exterior surface. On the inside, these rivets flange out to heads 8 millimetres wide. It is assumed that these rivets were attachment points for a chin strap. The exterior

of the piece has a smoothly finished surface, while the interior is rougher and bears hammer marks. There is nothing to indicate this helmet had a liner.

A second helmet is not only corroded but also badly crushed and torn, apparently from some aspect of the wrecking process (Fig. 9.2). It was originally made of a single piece of iron approximately 3.5 millimetres thick, also smoothly finished on the exterior and rougher on the interior. None of the lower portions of the helmet, including the brim, have survived, but the upper part of the bowl has, and it bears a central comb running along the crown that is nearly identical to that of the other helmet. From the partial remains, the two helmets look to have been of the same shape and design.



Figure 9.2. Crushed St. Johns Helmet 92-1300, two views. (Photo: Dylan Kibler/MFMHS).

Helmets are designed with the basic purpose of covering and protecting the user's head from shock and impact, and iron or steel helmets of this general type were in use for this purpose throughout the early American colonial period. These helmets are found in a variety of styles with a sometimes confusing array of names. Some of the Spanish names given to helmets from the period are *Yelmo*, *almete* (helmet), *celada* (salade), *morrión* (morion), *capacete* (cabasset), *borgoñota* (burgonet), *basinete* (basinet), *sombrero* or *capel de fierro* (hat of iron), *capiello* or *capellina*, *casquete*, *barreta* or *birrete* (Marchesi, 1849: 27). A dispatch to the officials of the *Casa de Contratación* regarding the outfitting of a fleet in 1548, says that it was necessary for the people traveling on the ships to carry *armaduras de cabeza* (head armours) without distinguishing a single particular type or style (Anonymous, 1548).

As for the type of the St. Johns example, the term *morion* is used to describe a piece in the Tower of London collection that is virtually identical. It is dated to ca. 1520-30, and believed to be of Italian origin (Dufty, 1968: plate LXXVIII). Another similarly styled iron helmet is a cabasset dated to the sixteenth

century in the Musée de la guerre au moyen-âge at Dordogne, France (Fig. 9.3). Dan Bashford worked to decipher the evolution of medieval and early modern helmet designs and devised a helpful chart to illustrate the changes through time (Fig. 9.4). Looking at Bashford's schematic, the St. Johns helmet looks to be a mélange of the morion, cabasset, and pikeman's pot. Certainly, its proportions and design correspond closely to styles that date from the mid sixteenth to the early seventeenth centuries.



Figure 9.3. A sixteenth-century cabasset. (Photo: Musée de la guerre au moyen-âge, Château de Castelnaud, Dordogne).

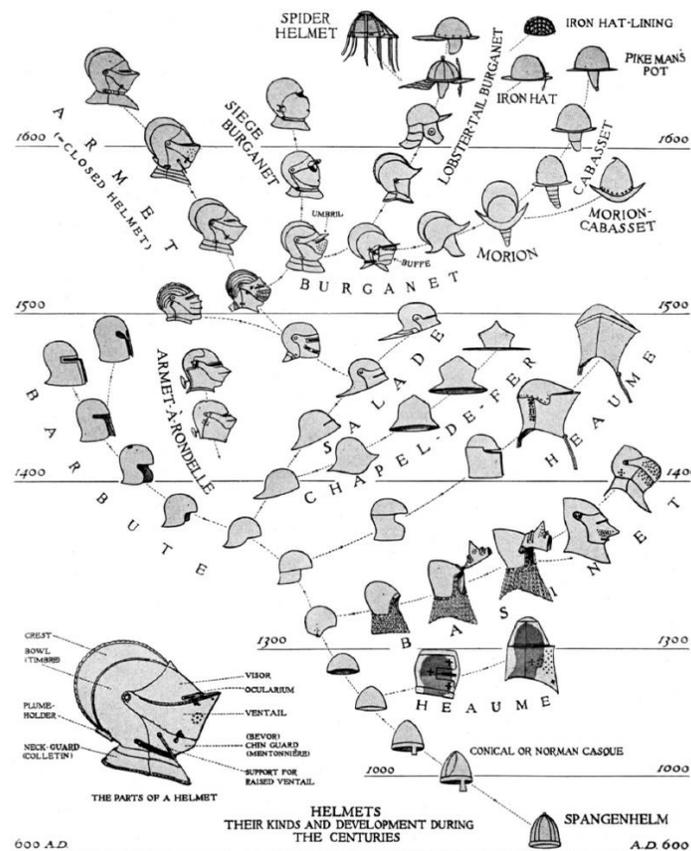


Figure 9.4. "Helmets: Their Kinds and Development During the Centuries," (from Bashford, 1915: 174).

Breastplates

Two breastplate fragments are found on the St. Johns wreck. Both pieces are from the upper, left shoulder areas of the breastplates, and each has elements of the neck and arm openings present. Each of the pieces has distinctive elements, and they represent two separate breastplates.



Figure 9.5. Breastplate Fragment 93-1300

Breastplate fragment 93-1300 is made of hammered iron plate some 2.25 millimetres thick. The edges around the arm and neck are folded upward for 11 millimetres and then back down again, creating a doubly-thick reinforcement at these edges. The neck is slightly V-shaped, with the bottom point of the neck some 14.5 centimetres from the arm edge (Fig. 9.5). This breastplate would have spanned approximately 29 centimetres from arm to arm.



Figure 9.6. Breastplate fragment 96-2114. Reverse (L) and Front (R) with Buckle.

The second breastplate, 96-2114, is an 11.5 x 13 centimetre fragment with the remains of an iron buckle riveted to it, indicating the piece was once paired with a backplate (Fig. 9.6). The iron plate is 2.1 millimetres thick. The edges are finished with a 4-millimetre-wide, U-shaped edge protruding toward the front. The uppermost part of the breastplate, where it would have passed over the shoulder, is 6.1 centimetres wide. The buckle is wide enough to have held a strap (presumably leather) 2.6 centimetres wide; it is fastened with two iron rivets. Though it is far from complete, this breastplate looks to have had a more rounded neck opening.

Summary

Research by Luis Weckmann shows that iron or steel armour, largely in the form of unspecified helmets, breastplates, and chainmail, was used by the Spanish in the American colonies throughout the conquest period and beyond, with the last regulatory edict for armour issued by the Council of the Indies in 1680 (Weckmann, 1992: 86-90). The men with Hernando de Soto's 1539 expedition to Florida wore both chainmail and iron plate armour, but they also found that thickly quilted cotton effectively repelled Native arrows (Vega, 1605 [1992]:367). Those with the De Soto expedition also found that iron or steel armour could be a death trap in water, when many men, after their canoes were overturned, promptly sank and drowned largely because of the extra weight of the metal (Gentleman of Elvas, 1557 [1992]:156). But plate armour continued to be considered useful, as is seen in 1565, when Pedro Menéndez de Avilés utilized 100 helmets and 30 large and small breastplates in his successful conquest and settlement of Florida (Lyon, 1992: 35). This reliance on iron plate appears to have diminished, at least in Florida, as armour inventories made there in the 1570's show a transition to almost all cotton-quilt armour (Peterson, 1956: 125).

According to the shipboard requirements of arms and armour for various sizes of Indies vessels, 20 to 30 helmets and 12 to 24 breastplates, along with similar numbers of shields, were the standard armour to be carried (Carlos II, 1681: F45R-46R). García de Palacio, in his later sixteenth-century recommendations for shipboard management, briefly described how both helmets and breastplates were to be used on ships. As he explained, when crews were called to defend the ship, part of their equipment would be "a strong morion (an open, hat-style helmet), and the burgonet (a closed helmet) with its coloured tufts..." (1587 [1993]: 334). García further wrote that when a ship was attacking another, it should divide its crew into two squads, one to attack and one to defend. The group that defended the ship was to be

armed "... with breastplate and morion, sword, dagger, and shield, and pistols (if any), and put a group along each side, near to the bulwarks at the bow...there to resist the enemy and defend the ship, because they have to be like a wall and give the protection of it" (1587: 336).

Plate armour has been found in early colonial American contexts, but only infrequently. Pieces of iron plate armour, some fitted with buckles, were found at the Spanish Florida site of Santa Elena (1566-87) (South, Skowronek, & Johnson, 1988: 109-115). At the English settlement of Jamestown in Virginia, steel cabasset helmets and breastplates have been found from an early seventeenth century context (Cotter & Hudson, 1957:73). The only other Spanish Indies shipboard context for armour comes from a North Florida site associated with the 1559 fleet of Tristan de Luna, which carried at least one iron breastplate. This breastplate was ca. 2.8 centimetres thick, and it bore buckles for attachment to a backplate. (Smith, Spirek, Bratten & Scott-Ireton, 1995: 113-115).



Figure 9.7. A Pikeman with Cabasset and Breastplate. (Adam van Breen, *De Nassausche wapenhandelinghe*. 1618, *Gravenhage in Hollant*. 2^o.-344 G 18, plate 1, Koninklijke Bibliotheek, Den Haag).

The helmets and breastplates found on the St. Johns wreck provided the wearers protection for the head and torso, which was only minimal coverage for the most vulnerable parts of the body. The helmets were made of somewhat thicker metal than the breastplates, seeming to indicate a greater need for protection of the head. Armour like this certainly would have been useful on a ship in battle to protect from shrapnel, splinters, or falling rigging resulting from incoming artillery fire. Considering the weaponry found on board the wreck, though – harquebuses, crossbows, pole-arms, and swords – it is assumed that any enemy was similarly equipped and that this armour was chiefly intended to protect against such arms. Little research has been done into the effectiveness of this type of armour against these weapons, but one study found that armour of the thicknesses seen on the St. Johns wreck would provide only marginal protection against harquebus-sized firearms fired from distances of 30 meters or greater (Stevens, Leever, & Dik, 2007:115-116).

Perhaps the light, open-style armour on the St. Johns ship is an indicator that the crew had not yet fully caught up to the reality of the penetrative power of firearms, but there could be other reasons for its design. Many of the weapons found on this ship could have been used more efficiently if the users were wearing such armour: Open faced helmets allowed for easier aim of shouldered weapons, and the flexibility of unencumbered arms and legs allowed for greater dexterity when using any pole-arms or swords. Also, for life at sea generally, mobility would be important on rolling decks crowded with people, equipment, and rigging, and especially so in the confusion of battle. There was also likely a need for some comfort in the tropical heat so prevalent across the Spanish Indies that only open armour could provide. And, by using the lightest armour necessary, the men of the St. Johns ship were perhaps giving themselves a better chance at escaping from drowning if they had the bad luck to fall overboard into the sea. Though it is not written anywhere, from the pieces on the St. Johns wreck, it looks as if the mariners of the early *Carrera de Indias* had found a balance in their armour between effectiveness and efficiency.

Chapter 10: HAND TOOLS

A wooden sailing ship was subject to any number of forces related to the wind and water, some resulting in general wear and tear, and others more catastrophic damage. A group of tools found on the St. John's wreck, mostly hand-held, iron implements, gives a good sense of the maintenance and repair activities on board a Spanish Indies ship of the sixteenth century. By comparing the wreck's collection to both the historical and archaeological records for the period, it clear that these tools fall within patterns that were both prescribed and observed.

Hammers



Figure 10.1. Claw Hammer 97-2318, bottom, side, and top views.

Three hammers were found on the shipwreck, and each is of a different style. One, an iron claw-hammer, is of a basic, traditional design generally associated with carpentry (Fig. 10.1). This same style has been in use since Roman times (Sloan, 1964:22). It is 18 centimetres long, with a working face of 2.5 by 2.0 centimetres. It weighs 635g (1.4lbs.), and it has a 2.8 x 2.1 centimetre, rectangular opening for a wooden handle, which was missing. This hammer was designed for driving and pulling nails, but would have been generally useful for other striking and prying purposes.



Figure 10.2. Top and side views of partial hammer 97-2346.

A second hammer is a resin cast fragment of only the forward half of the original piece (Fig. 10.2). It is 7.8 centimetres long, has a battered, round face of 3.0 centimetres diameter, and a hexagonal neck leading to an eye that held a round handle of 2.3 centimetres diameter. The hammer broke at the eye, and the rear portion has not been found, leaving its complete design unknown. Salaman depicts a similarly-styled hammer and labels it a ship's carpenter's hammer (1975:232).

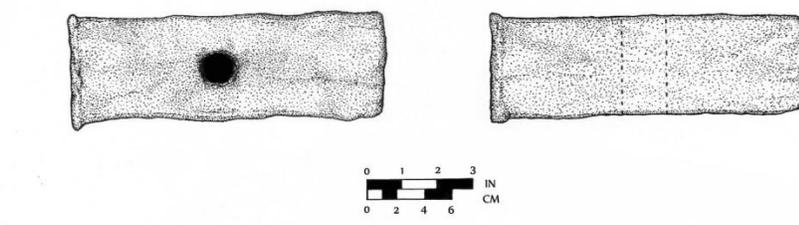


Figure 10.3. Drawings of top and side views of maul 92-1000L

An iron maul from the ship is a simple, large block-shape with working faces on both ends, though one face is somewhat more flattened and flared, apparently from having seen more use than the other (Fig. 10.3). The maul is very heavy, weighing 7.38 kilograms, with dimensions of 22.0 by 7.3 by 6.8 centimetres. A round, 3.0 centimetre diameter hole is pierced through the centre for a handle. Such a tool was used for driving items with a fair amount of force. It would have been useful to knock large hull timbers into alignment, and also to drive home the largest of the spikes, pins, and bolts. Interestingly, the maul was found between the three big tube guns in association with a concentration of large shot. It is conceivable that this heavy hammer was used with the large artillery to drive the iron wedges behind their exchangeable breech chambers. Similar iron mauls were found on both of the 1554 fleet wrecks at Padre Island, Texas, with one weighing 8.8 kilograms (Arnold & Weddle, 1978:241; Olds, 1976:53).

Drift Hooks



Figure 10.4. Drift Hooks or Drift Bore Pins 92-0849 (top) and 96-2136 (bottom).

Iron drift-hooks, or draw-bore pins, were used to align wooden structural elements by driving them like large nails through pre-drilled holes (Moxon, 1703 [1989]: plate 8, 123; Salaman, 1975: 174-175). Once the wooden components were aligned, the pins were then tapped back out by knocking upward on the protruding hook; bolts or other fasteners could then be more easily placed in the aligned holes.

Two of these pins are found in the St. Johns collection; both were recovered by casting them of resin from the marine encrustation (Fig. 10.4). They each have intact hook-ends, but both have broken shafts and were once longer. One drift hook, 92-0849, has a 1.8 centimetre diameter shaft that is 66.5 centimetres long. The base of the triangular hook protrudes 4 centimetres from the shaft. Drift hook 96-2136 is made of a shaft 2.0 centimetres diameter and is 48.8 centimetres long. The hook protrudes 2 centimetres from the shaft. The piece is slightly curved; almost certainly the result of some force in the shipwreck process.

Axe

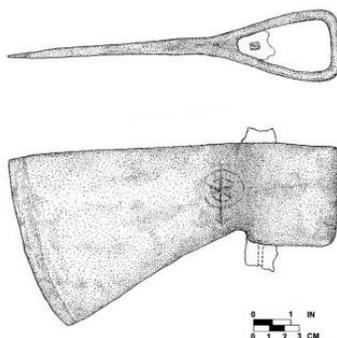


Figure 10.5. Axe 97-2448, top and side views. (Drawing: Robert Cummings/MFMHS).

An iron axe head for cutting wood was carried on the ship (Fig. 10.5). The cutting edge is 11.2 centimetres wide, and overall, the axe is 20.5 centimetres long. The eye is shaped to hold a teardrop-shaped handle. A small portion of the wood did survive, and it had evidence of an iron nail shank that had been driven into the top to help secure the iron head to the handle. A mark consisting of an X contained within two circles, all pierced by a downward pointing arrow, has been stamped into both sides. It has no lug, and no thickening at the poll (butt) end, indicative of the Iberian tradition (Salaman, 1975:54). This axe head compares closely with two found on the *San Pedro* of 1596, wrecked near Bermuda (Hoyt, 1985), the 1622 galleon *Atocha* sunk at the Florida Keys, the Ines de Soto wreck (Escobar Guio, 1998a: 203), and the Molasses Reef wreck at Turks & Caicos (Keith, 1987:281).

Adzes

Adzes were iron heads mounted on wooden handles with flat blades and flared cutting edges that were mounted perpendicularly to the line of the handle. The adze was used to refine the shape of a timber; its function falling between that of an axe and a plane and making finished, flat surfaces on wooden components (Sloane, 1964: 26).

A single adze blade from the site is of a type called the “slot adze” (Fig. 10.6). It has no eye for a handle, but was instead attached by its narrow tang with an iron strap to a wooden with an enlarged head (see Fig. 10.14). This adze is 17.9 centimetres long; the tang is 1.7 centimetres wide, and the cutting edge is 6.6 centimetres wide. Slot-adze blades have also been found on the Spanish galleon *Atocha* of 1622 and the Molasses Reef wreck (Keith 1987:285).



Figure 10.6. Slot Adze 97-2250, top and side views.



Figure 10.7. Adze 97-2369A, side and top views.

A second adze from the site is of a fixed-head style in that the handle fit into a socket and was riveted fast (Fig. 10.7). This once-iron adze had to be cast of resin from its concretion. The aft part of the socket was broken and is missing, making it impossible to know if there was any type of poll (peg-like spike) on the back-side of the head. Salaman labels a nearly identical piece with a poll as a shipwright's adze (Salaman, 1967). This piece is 16.9 centimetres long, and the cutting edge is 7.2 centimetres wide. An adze similar to the St. Johns example was found on the Molasses Reef wreck (Keith, 1987:283).

Pry Bars



Figure 10.8. SJBW Pry Bar 97-2553.

Pry bar 97-2553 is the only complete example from the wreck (Fig. 10.8). It is made of wrought-iron and is 124.5 centimetres long. It has a 3.8-centimetre-wide flattened prying surface at one end, a shaft 2.8 centimetres square, and a pointed tip at the other end.

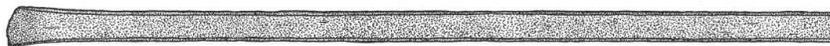


Figure 10.9. SJBW Pry Bar 95-1664.

95-1664 is 65.5 centimetres long by 2.7 square (Fig. 10.9). It is broken at both ends but one end does begin to flare and flatten into a wider prying surface. Similarly designed iron pry bars have been recovered from the 1622 galleons *Santa Margarita* and *Nuestra Señora de Atocha*.

Rave Hook or Caulking Hook



Figure 10.10. Rave Hook, or Caulking Hook 95-1688, top and side views.

The resin cast of an iron hook is what remains of a caulker's tool known as a rave hook or caulking hook (Fig. 10.10). The rave hook was used to extract old caulk from between planking seams and anywhere else that it might have been packed. The blade-like hook of the St. Johns example is approximately 6 centimetres long; it is 4.5 millimetres thick at the bottom edge and 1.5 millimetres at the top edge. It is on an 18.6 centimetre shaft that tapers slightly from one centimetre to a hexagonal 1.2 centimetres at the broken base. The backside of the shaft has been pinched to create a bulge, where a hole has been pierced, and where, apparently, a now-missing ring once looped through. Similar rave hooks, without pierced openings or rings, have been recovered from the 1554 fleet shipwrecks (Arnold & Weddle, 1978:241; Olds, 1976:53) and the 1622 galleons *Santa Margarita* and *Nuestra Señora de Atocha*.

Ringed Chisel



Figure 10.11. Three views of ringed chisel 96-2128 of unknown function.

Artefact 96-2128 is a resin cast of an unusually-styled chisel with a ring looped through the shank (Fig. 10.11). It was originally iron, 20 centimetres long and 1.3 centimetres in diameter. The end nearest the ring is broken, making it unclear how it was finished. There are similarities between the design of the shaft of this piece and rave hook 95-1688, especially the pinched and pierced section that holds the ring. It might be that these pieces were different sizes of the same design, with each example bearing one of the two different ends.

Grindstone



Figure 10.12. Fragmented Grindstone, 92-0881, 92-0902, 92-0952.

Three fragments of a round, sandstone grindstone were found on the wreck. The recovered pieces do not form a complete specimen, but when assembled they do show that the wheel-like piece was approximately 53 centimetres in diameter (Fig. 10.12). Each of the pieces is 8.5 centimetres thick. Considering the shipboard context and the many edged implements from the site, this stone was a sharpening stone for maintaining steel and iron tools, cutlery, and weapons. Grindstones mounted in wooden frames, where they were rotated to deliver their abrasive force, turned by a hand-crank or foot-pedal crank (Fig. 10.13). Similar stones have been recovered from the 1622 galleons *Santa Margarita* and *Nuestra Señora de Atocha*.



Figure 10.13. *Der Schleifer* [The Grinder], (Amman & Sachs, 1578 [1973]: 92).

Tool Use On Board Ship

The historical record indicates that tools like those found on the St. Johns wreck were commonly associated with shipbuilding, and the repair and maintenance of wooden sailing vessels. In the colonial era, carpenters working in Spanish shipyards were required to provide a set of tools: “The carpenter has to bring an axe, saws, or a large, two-handed saw, a two-handed adze, a gouge, large augers of three types (sizes), a claw hammer, a sledgehammer, and two chisels” (Casa de Contratación, 1618 [1841]:30). A similar requirement was made of caulkers, too: “The Caulker has to bring a mallet, five irons, a gouge, rave hook, maul, claw hammer, oakum remover; three different augers, augmented by the caulking auger” (ibid.). W. L. Goodman (1972), cited in Salaman, (1975: 468) describes the typical English shipwright’s tool kit used between 1547-1644 as being, “An Axe, Adze; Handsaw; Chisel; Gouge; Shave (or drawknife); various Hammers including a Maul; Auger; Spike Gimlet; Wimble (or Brace); Caulking Irons and a Caulking Mallet; and a Rave Hook.”

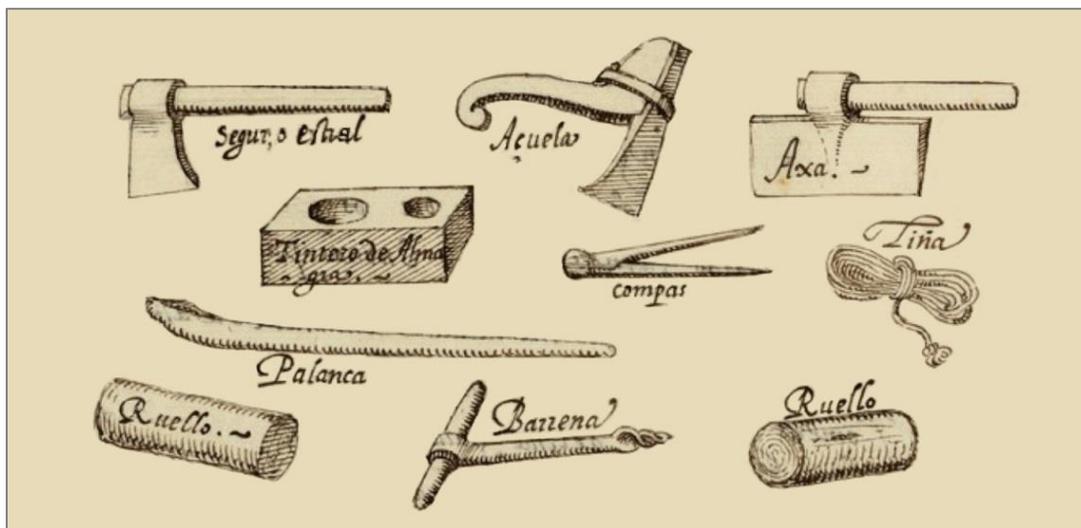


Figure 10.14. Spanish Carpenter’s and Logging Tools, ca. 1570: *Segur o estival* [Hatchet], *Açuela* [Adze], *Axa* [Axe], *Tintero de almagra* [Red-ochre inkwell], *Compás* [Compass], *Liña* [Line], *Palanca* [Lever or Pry Bar], *Ruello* [Roller], *Barrena* [Auger], and *Ruello* [Roller]. (From Turriano ca. 1570: F248v).

Moving from the shipyard to the ship, Diego García de Palacio, in his treatise outlining the best practices for sixteenth-century Spanish Indies vessels, made it clear that prudent ship-owners should always supply their ships with hand tools. His recommended list of tools for use on a ship consisted of “...two or three augers, a mallet, *vandaria* [?] and hammer, 4 chisels, a two-handed saw and two smaller for one [hand], 2 adzes, 6 hatchets, four hoes/adzes, two iron sledges ...,” to be carried among the other general supplies on board (1587 [1993]: 307-8).

García de Palacio elaborated further, and gave a clear, direct account of the roles the carpenter and caulker served on board a sixteenth-century Indies ship under sail. As he wrote: “The Carpenter has to be a good sailor, and experienced, because repairing anything of the ship in time of need consists more in experience, and being a mariner, than in the art of carpentry, but has to know the dimensions necessary for making, if necessary, a boat, a shallop and other things that arise and he is to understand the turning of sheaves, pulleys, trucks, and parrels and dead-eyes and winches for line [*menas de troza*]. For all of which he should also come equipped with a two-handed saw, and another for one hand, and another small; four axes, four drawing knives - three flat and one concave to shape braces, yards and mast cheeks, and other things. And be supplied with chisels, gouges, drills, mallets, hammers, files, clamp, planes, red ochre and wool line to mark, with other small things belonging to his position” (García de Palacio, 1587 [1993]: 320-21).

Of the caulker, García de Palacio said, “This position requires skill, and it is very suitable that he is an experienced and good sailor. He has to take special care of the pump, to coordinate it and always take it as a thing that is of his charge. And when the vessel will be sailing and also if it will be in port, to seal the decks, the upper decks, the interiors, and the sides, so that it is in good repair everywhere. And go down to the hold and the decks, and inspect them; if any water shows, pump it. And he will inspect the pump often... And a dozen augers to drill one after the other, to place some bolt/pin if necessary; tallow and canvas for the straps, and half a dozen skins for scuppers, caulking irons, mallets, and other things of his art, so that he does not need anything more” (ibid: 321).

It is clear from the multiple recovered tools specific to woodworking and caulking that a carpenter and a caulker were almost certainly present on board the St. Johns ship: An axe and adzes were there to cut and shape wooden pieces as needed; rive hooks could remove old caulking; various hammers could have driven fasteners of all sizes, as well as helped pack new caulk in plank seams. The collection of tools from the wreck do not form a complete set by any of the accounts seen for sixteenth-century ship’s supplies, or those recommended for ship’s carpenters or caulkers, but they do fall within the parameters of those prescribed kits. It is clear that the recovered implements were on board to be used by those officers to maintain and repair the ship, whether it was in port or at sea, where such men essentially served as “doctors” to the vessel itself. If the ship needed to be repaired, or new items fashioned for it, they had the tools to do so.

The tools from the St. Johns wreck could have also served any number of other purposes, too: hammers could have aided the repair of armour, weaponry, and rigging; the heavy maul could have driven wedges

behind artillery breech chambers; an axe could help cut down a mast in a storm, or chop through a too-tightly bound line; and the grindstone could have sharpened or shaped just about any hand-held object with its abrasive power. And importantly, in a pinch, almost any of the iron tools found on the site could have been used quite effectively as weapons in hand-to-hand combat by anyone on board, passengers or crew, with no training necessary.

The archaeological record shows a significant overlap between the St. Johns tools and those found on other sixteenth and seventeenth-century Spanish Indies shipwreck sites. This would indicate, much as Diego García de Palacio had recommended, Spanish shipmasters throughout the early colonial period were well aware that having tools on board, as well as employing men who knew how to use them, was essential to the success of a ship sailing in the *Carrera de Indias*.

Chapter 11: CERAMICS

The largest group of artefacts from any single category found on the St. John's Bahamas wreck is the fragmentary remains of ceramic vessels. The largest part of this group consists of sherds from shattered earthenware storage containers, but other vessels, such as plates, drinking vessels, drug containers, pans, and mortars are found as well. These pieces represent a wide range of functions, decorative styles, and places of manufacture within the Spanish Empire, and they reflect the lifeways on board the ship and the diversity of Spanish colonial culture at the time of the ship's sinking.

Olive Jars/*Botijas*

A currently unknown number, but one certainly well into the thousands, of fragments from amphora-like, earthenware "olive jars" constitutes the vast majority of the St. Johns ceramic collection. Many of these pieces have yet to be cleaned of their coralline encrustation. The fragments of the jars that have been cleaned show vessels that were wheel-thrown, round-bottomed, bulbous vessels with relatively narrow necks and mouths, made of a distinctive, sand-tempered, unglazed, earthenware paste that ranges in colour from tan to pinkish-brown. By counting the rims that have been collected from the site, we can see that the St. Johns assemblage represents the remains of at least 130 of the bulbous containers.



Figure 11.1. An olive Jar rim and body fragments amongst ballast stones, St. Johns wreck, 1999. (Photo: Dylan Kibler/MFMHS).

Fortunately, one intact jar was encountered by St. John's Expeditions in their 1991 discovery of the shipwreck, and it provides a model for the general size and appearance of these particular storage

containers (Fig. 11.2). The complete olive jar measures 50.5 centimetres tall and 34 centimetres at its widest diameter, and it has a capacity of 19.78 litres. The jar has a dry weight of 6.592 kilograms, and when filled with water it weighs 26.372 kilograms. Other, large, rim fragments, with significant shoulder and side sections still attached, reinforce the idea for the same general size and shape of all the St. Johns olive jar remains (Fig. 11.3).



Figure 11.2. Two views of intact St. Johns Wreck olive jar. (Drawing: Cheryl Clark/MFMHS; Photo: Dylan Kibler/MFMHS).

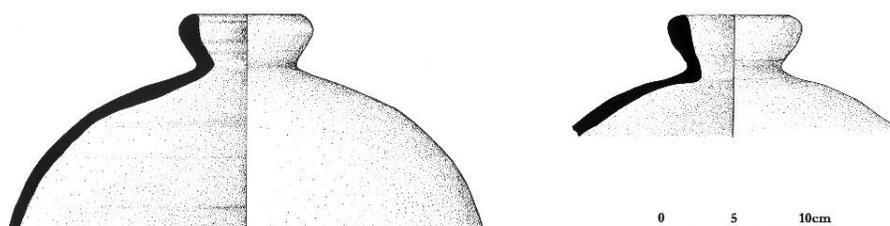


Figure 11.3. Two larger St. Johns olive jar rim and shoulder fragments.

The rims of the jars from the St. Johns wreck vary, but within a range of styles (Fig. 11.4). The rims are from 7 to 10 centimetres in diameter and are almost all around 4 centimetres tall. The rims range from being thin and straight-sided to a thicker, rounder, ring-shaped style. The rims are all everted, apparently to facilitate pouring or the placement of stoppers, though some do have a slight inward recurvature at the top edge that would have made both functions more difficult.

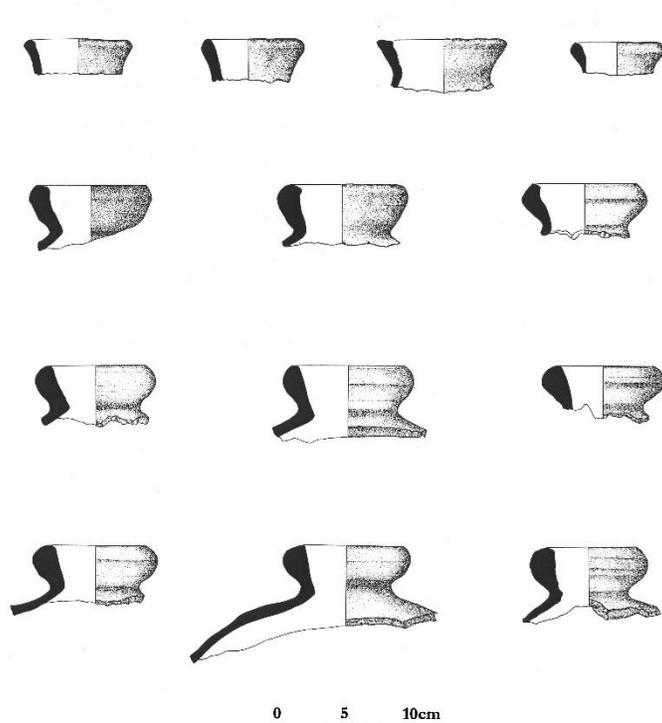


Figure 11.4. The range of earthenware “olive jar” rim types recovered from the St. Johns Wreck, from thin, straight-sided forms, to thicker, rounded types (Drawings: C.M. Clark, F. Weeks, & R. Cummings/MFMHS).



Figure 11.5. St. Johns olive jar rims, the interiors coated with pitch or resin.

Some of the St. Johns jar necks were sealed with pitch or resin, a feature that is in line with notations on shipping manifests describing some jars having their openings “*en yeso*,” [plastered] (see table 11.1). A sealed olive jar from the 1622 galleon *Nuestra Señora de Atocha*, when x-rayed, showed a wooden plug set into the mouth of the jar, and the plug was then covered with the same sort of pitch (Marken, 1994: 116-117). It appears probable that the St. Johns jars were sealed in a similar manner, but the wooden stoppers have deteriorated. Some of the body sherds also have a thin coating of pitch on the interior surfaces, apparently to inhibit the seepage of liquids through the clay.



Figure 11.6. Various markings from St. Johns olive jar sherds.

Three olive jar body sherds exhibit intentional, man-made markings (Fig. 11.6). Two of the markings were inscribed into the body of the clay before firing: one, a series of lines forming a checkerboard pattern, another a series of indecipherable letter fragments done in a style called *a peine* [combed], which is also found on earthenware jars from Moorish Spain (Aguado Villalba, 1991:76), and the third mark – a section of a heavy line with an adjacent dot looks to have been scored into the surface after firing. None of the St. Johns olive jar rims have markings. More marks are expected to be uncovered as the collection of body sherds continues to be cleaned. Shipping records show markings on jars were sometimes used to denote ownership (Fig. 11.11), but if this was the purpose of the St. Johns marks is not known.

Six, amorphous, ceramic globules made of the same material as the olive jars were also found, and, oddly, these pieces were all indented by fingertips. One was found attached to the inside face of a fragment of the bottom of an olive jar, and the two pieces were fired together, showing a direct connection between the jars and the globs. Remarkably, when casts are made from the indentations, near-perfect human fingertips, some with vestiges of fingerprints, are revealed (Fig. 11.7). It is surmised

that these are bits of excess clay that built up on the potters' fingers as the vessels were being thrown, and they fell off or were shaken off in the process.



Figure 11.7. Earthenware fingertip impression found fused to the inside of an olive jar fragment (L) and cast of the impression, revealing a human fingertip with prints (R).

Olive jar Studies

The term “Olive Jar” was first used to describe these containers by US archaeologist William Holmes, whose 1903 study of American aboriginal ceramics noted the presence of Spanish vessels whose wheel-thrown forms “forms are little varied, the short bottle neck and the long-pointed base being notable characteristics” (Holmes, 1903:129-130). Holmes believed that olives had been shipped in such jars (and, in an early nod to marine archaeological resources, he also noted that examples had been recovered from underwater dredging in the Caribbean, from suspected shipwreck sites).

Florida archaeologist John Goggin, in a 1960 study that has proved to be the foundation for modern research of this type of ceramic, followed Holmes’ precedent of calling these vessels “olive jars.” But even Goggin realized that “olive jar” was not wholly accurate or satisfactory, but he felt that equivalent Spanish terms – *botija*, *botijuela*, *tinaja* – were not wholly correct, either, so he decided to stay with olive jar, and his choice is largely responsible for its continued use today.

Goggin noted changes in the design of the olive jar and found three stylistic eras for the vessels in the Americas: an “early” form that is found in ca. 1492-1580 contexts; a “middle” style dating to ca. 1580-1780; and “late” forms that date from ca. 1750 through the nineteenth century (Goggin, 1960:23-24)(Fig. 11.8). The distinctions between eras are determined by the jars’ shapes, rim forms, and, to a lesser extent, the presence of handles, vessel wall thickness, and paste characteristics. According to Goggin’s scheme, olive jars in the Americas started as thin-walled, rounded vessels with two opposing

handles arcing from the shoulder to the rim. In the middle period, the jars changed to heavier, more-elongated, egg-shaped vessels of three different sizes, with thickened rims. In the late period the bulbous bodies remained, but jars of a sharply conical design also came into use; rims narrowed from their heavy, almost rectangular cross-section; some late-period olive jars show a paste with very little sand temper. Broadly speaking, with some reconsideration of the early style, this chronology looks to have held up well.

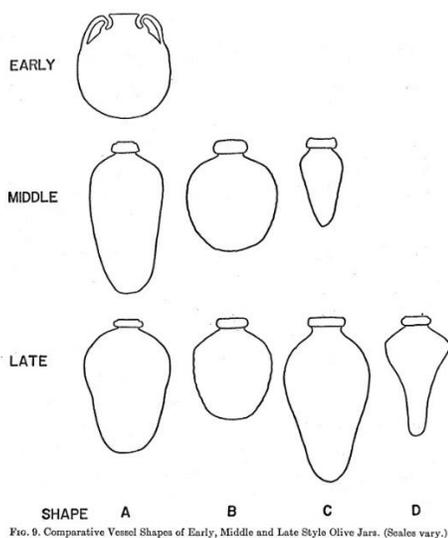


FIG. 9. Comparative Vessel Shapes of Early, Middle and Late Style Olive Jars. (Scales vary.)

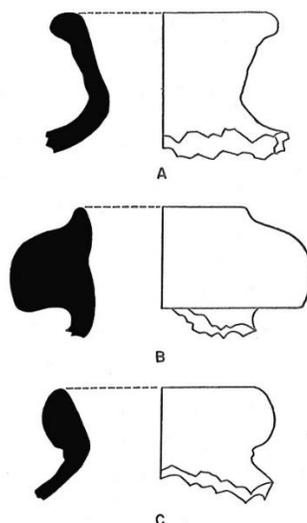


FIG. 10. Comparative Typical Olive Jar Mouth Details. a, Early Style. b, Middle Style. c, Late Style. (Life size.)

Figure 11.8. Left: Goggin's scheme for olive jar body forms through the colonial period; the early, middle, and late eras, with variations found within each. Right: The evolution of the olive jar rim across the centuries (1960:23-24). For this study, considering the apparent sixteenth-century date of the St. Johns jars, it is most important to consider Goggin's early and middle styles. First, it must be pointed out that Goggin's early-style jar is actually more closely-related to a *cantimplora*, or canteen (Lister and Lister, 1976: 31). Avery has made clear that the olive jar is descended from the Roman amphora, and that this *cantimplora*-style jar is not in the amphora tradition (1997:85; 128-129). In fact, jars similar to the handle-less, egg-shaped "Type-A" middle-style jar are known in southern Spain from Medieval, Moorish contexts (Bazzana and Montmessin, 1985:31; Aguado Villalba, 1991:77; Lister and Lister, 1987:26), and fifteenth and early sixteenth-century Christian-era contexts (Lister and Lister, 1987: 100). Goggin, who based his early-style olive jar on a single intact vessel and 15 mouth and rim specimens from four different early sixteenth-century land sites across the Spanish Indies, assumed that, because the rims he saw matched the *cantimplora* rim, they must represent the same vessel. But as is seen in the St. Johns collection, the

same thin, everted rims are found, but there are no cantimplora fragments or handles, only “middle style” olive jars.

George Avery refined the chronology of rim forms for the middle-period, type-A jars, finding that they do have measurable style changes through time (1993) (Fig. 11.9). The various St. Johns forms are on the early side of the spectrum.

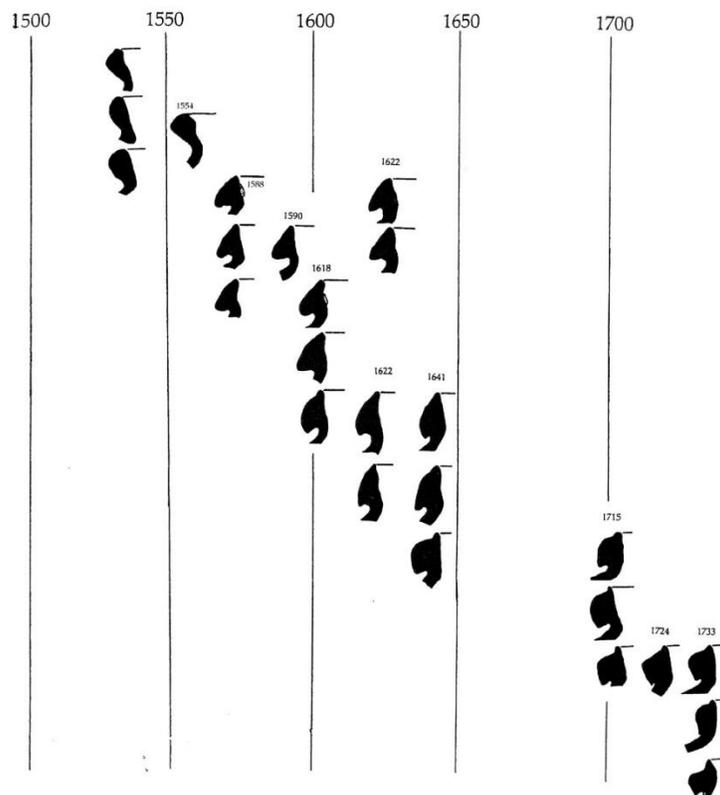


Figure 11.9. A Chronological Framework for Middle style Olive Jar Shape A Rims (Avery, 1993).

Olive Jars on Ships

García de Palacio recommended that Spanish *Carrera de Indias* ships carry 100 *botijas* for water (1587:308). In modern Spanish, the word *botija* means a rounded, narrow-necked clay jug (Real Academia Española, 2015), and, according to historical documents, the definition appears to have been the same in the colonial era, as well. A search of shipping lists shows a variety of *botijas* being used to carry all sorts of goods from Spain to the Americas in the sixteenth century. As early as 1509, in a fleet organized by Diego Colon, many hundreds of *botijas*, in a variety of sizes (*arroba*, *media arroba*, *media azumbre*, *cuarta*) and filled with wine, oil, vinegar, and honey, among other things were shipped (Otté,

1964 [1987]: 311-313). Another survey of shipping lists through the middle decades of the 1500's shows *botijas* and *botijas peruleras* being used to carry olives, oil, and beans (Torre Revelo, 1943). Additionally, lists of supplies being shipped into Florida in the third quarter of the sixteenth century refer to *botijas* and *botijas peruleras*, carrying water, wine, olive oil, olives, and salted pork (Lyon, 1992:34-49). More specifically, by examining the cargo manifest for the *Los Tres Reyes Magos*, a vessel of unspecified tonnage, bound for Honduras from Spain in 1557, a greater sense of the types of *botijas*, their contents, and the numbers carried on board one *Carrera de Indias* ship is gained (Table 11.1).

Botijas on Los Tres Reyes Magos, 1557

| | |
|---|---|
| 25 <i>botijas</i> with 16 <i>arrobas</i> of oil | ----- |
| 4 <i>botijas peruleras</i> of vinegar | 50 <i>botijas</i> of oil, which each one has a half <i>arroba</i> ; |
| 26 <i>botijas medio perulera</i> of olives | sent and sealed with plaster, and they carry a "Y" as |
| ----- | a mark on the mouth. |
| 40 <i>botijas de a media arroba</i> in which goes 20 | ----- |
| <i>arrobas</i> of oil | 4 <i>botijas peruleras</i> of olives |
| 72 <i>botijas peruleras vacias</i> [empty] | ----- |
| ----- | 15 <i>arrobas</i> of oil in 30 <i>botijas</i> |
| 6 <i>botijas de a media arroba</i> , each one of oil | ----- |
| 6 <i>botijas de a media arroba</i> , each one of syrup | 4 <i>botijas</i> of olives |
| 2 <i>botijas</i> of vinegar of half an <i>arroba</i> | 6 <i>botijas</i> of hazelnuts |
| ----- | 6 <i>botijas</i> of almonds |
| 160 <i>botijas</i> of oil of half an <i>arroba</i> , enclosed | ----- |
| ----- | 1 <i>botija</i> of hazelnuts |
| 150 <i>botijas peruleras</i> | ----- |
| ----- | 20 <i>botijas perulera</i> filled with vinegar |
| 10 <i>arrobas</i> of oil in 20 <i>botijas</i> | ----- |
| ----- | 12 <i>botijas perulera</i> of olives |
| 30 <i>botijas medio peruleras</i> of olives | ---- |
| ----- | 60 <i>arrobas</i> of oil in 120 <i>botijas</i> |
| 8 <i>botijas</i> of <i>perulera</i> olives | ---- |
| 20 <i>botijas</i> of olives of half an <i>arroba</i> | 7 <i>botijas perulera</i> filled with almonds |
| 1 <i>botija</i> of hazelnuts | 16 <i>almudes</i> of hazelnuts in 4 <i>botijas</i> |
| 1 <i>botija</i> of almonds in fitted box [?, <i>en cave caja</i>]. | ---- |
| ----- | 150 <i>botijas perulera</i> |
| 1 <i>botija perulera</i> of hazelnuts | |
| 4 <i>botijas</i> of olives | Total: |
| ----- | 967 Jars |
| 50 <i>botijas</i> of oil of [illegible] | |

Table 11.1: Entries for earthenware jars (*botijas*) on the Spanish ship *Los Tres Reyes Magos*, bound for Honduras, 1557. (Archivo General de Indias, Contratación, 1079, N.8).

The *Tres Reyes Magos* carried a variety of jars: *botijas*, *botijas peruleras*, *botijas medio perulera*, and *botijas* of half an *arroba*. These *botijas* held oil, vinegar, olives, syrup, hazelnuts, almonds, and some jars were listed with no contents and appear to have been shipped empty, the jar itself being the commodity. Others were sealed with “plaster” and marked on the rims. Clearly, as is seen on this one ship, the earthenware jugs were key shipboard containers in bringing products from Spain to the Spanish colonies.

Prominent in the historical record, in the *Tres Reyes Magos* register and beyond, is the term *botija perulera* – a label whose meaning is antiquated and not entirely clear. The adjective *perulera*, or *perulero* in the masculine, has multiple meanings, both of which can be applicable to the types of jars examined here. *Perulero*, first used in 1534, is “a pejorative term used outside Peru during colonial times to describe Peruvian merchants, their agents in Spain, and Iberian merchants with commercial interests in Peru” (Quiroz, 2005: 836). But *perulera* is also defined as “wide-bellied;” apt for these jars (Lister & Lister, 1987: 133). It is unclear which one, if not both, of these meanings was applied to these jars in the colonial era. To confuse the matter a bit further, there were many *cajas peruleras* [*caja* = box] listed on the *Los Tres Reyes Magos* manifest, each filled with parcels of cloth, shoes, books, and other consumer goods for colonial markets.

Whatever the exact meaning of *perulera* might have been in the sixteenth century, a later, eighteenth-century dictionary of Hispano-American terms offers one concrete characterization for the jar of this type: “The *Botija Perulera* has a *vara* and a half of height, and half that for diameter at its maximum breadth (1.25 x 0.63 meters); it is an inverted-cone shape: it contains 23 ½ regular *frascos*, and they carry in them to the Kingdoms of Tierra Firme, Guatemala, and Mexico, wine, aguardiente, olives, and other things. The Negroes, when unloading these *botijas*, they put them on their head with a coil of linen surrounding the base, and they go walking and swaying with them without losing their balance” (Alcedo, 1789: 28). The St. Johns jar was certainly used in the Indies trade and it was wide-bellied, but it is also somewhat smaller than the dimensions outlined by Alcedo. Whether this size difference is a reflection of the fact that Alcedo was writing long after the St. Johns wreck sailed, or if he only loosely described the size, is not clear. Marken, in a broad survey of olive jars from Spanish shipwrecks across the colonial era, concluded that the *botija perulera* is the same as Goggin’s “Type A” vessels and the *botija media arroba* or *botija media perulera* coincides with the smaller, rounder “Type B” jar, while allowing for regional and manufacturers’ inconsistencies (Marken, 1994: 49).

The archaeologist Álvaro Brizuela found, in a survey of 126 olive jars from early colonial contexts at Panama la Vieja, that the earthenware vessels came in three forms: large, with a volume of 1 to almost 1½ Castilian *arrobas* of wine, or little more than 1½ *arrobas* of oil; medium, with a little less than 1 *arroba* of oil; and small, with a capacity of half an *arroba* (Mena García, 2004:463). Another survey of sixteenth-century olive jars found four sizes: large, ranging from 43-49 centimeters tall and 16.6-20.5 litres capacity; medium, from 35-39 centimetres tall and 10.0-11.6 litres; small, ranging from 28-34 centimetres tall and 6.1-9.4 litres volume; and very small jars of less than 23 centimetres in height and an unrecorded volume (Mena García, 2004:464). In the same study, a review of historical documents found that the Castilian *arroba* for wine is equal to 16.13 litres, and for oil 12.5 litres. This research also revealed that the typical *botija* for transporting wine had one and a quarter *arrobas* volume (20.1625 litres), while the container most frequently used to transport oil was the "glazed and sealed *botija*" with capacity of one *arroba* (12.5 litres), half an *arroba* (6.25 litres) or a quarter *arroba* (3.125 litres). Vinegar was also transported most frequently in jars of one and a half *arrobas*. The intact St. Johns jar, at 50.5 centimetres tall, with a volume of 19.78 litres, meets the characteristics of a large, sixteenth-century *botija* capable of carrying 1¼ *arrobas* of wine, and, because of its size, form, and its context on an Indies ship, is almost surely an early form of the *botija perulera*.

Similar jars have been found at the Spanish settlement of Santa Elena in South Carolina (occupied 1566-1587). One nearly-intact jar is smaller, at 36 centimetres tall, but similarly-proportioned, and it has a slightly-rounded rim profile similar to some of the thicker St. Johns examples (South, Skowronek, & Johnson, 1988: 271-283). Other examples of Santa Elena jars are significantly smaller and rounder than the St. Johns and correspond to Goggin's "Type B," middle-style jar or those of *media arroba* or *cuarta arroba* capacity. Other examples of neck and rim forms match both Goggin's early-style jar and the more straight-sided St. Johns specimens, though some of the Santa Elena rims flare into a much more heavily-built triangular cross-section not found on the St. Johns site. Other sixteenth-century Spanish-Indies shipwrecks have similarly-styled, but generally far fewer, olive jar rims. On the Molasses Reef Wreck, 102 olive jar fragments were found, including two rims (Keith, 1987: 240-242). Drawings of the Molasses Reef rims show they are similar to some of the more rounded St. Johns examples. The 1554 *flota* wrecks have yielded 790 olive jar sherds from an unknown number of vessels, with one rim found among them (Olds, 1976: 137-138). The relatively straight-sided rim was identified as coinciding with Goggin's early-style, canteen-like jar, though no handle fragments were found. At the Ines de Soto Reef wreck in Cuba, 96 olive jar body fragments and fifteen necks and rims were found; all of the rims corresponded with the styles seen on the St. Johns wreck, except for a thicker style with a triangular cross-section similar to the

heavier type found at Santa Elena. The Ines de Soto site also yielded a nearly complete example of a handle-less, *media arroba* jar with an everted, straight-sided rim typical of Goggin's early-style jar (and some of the St. Johns rims), proving that that rim style was not exclusive to the canteen-like *cantimploras* (Dominguez Gonzalez, 1998: 164-167). Also, an unusual and extremely small, 18-centimetre-tall *botija*-style jar with a similarly-styled rim was found on the wreck. On the Emanuel Point I shipwreck there were three rims, ranging from nearly straight-sided with a slight thickening at the lip edge, to a thicker, rounded rim profile, each matching closely with examples from the St. Johns site (Smith, Spirek, Bratten & Scott-Ireton, 1995:). Many of the body fragments from the Emanuel Point site were coated on the interior with pitch or resin. The same resin coating was seen on the Emanuel Point II site, as well (Sorset, 2009). The 1565 whaling galleon *San Juan* at Red Bay, Newfoundland wreck yielded one olive jar rim that was thicker and more angular than the St. Johns examples, and two bulbous bodies minus their rims, each of approximately 6.5 litres volume (Gusset, 2007:52-55).

According to Goggin, olive jar walls thickened from the early period to the middle, with early-style jars averaging 7 millimetres thick, and middle-style jars averaging between 10 and 12 millimetres (Goggin, 1960:27). This idea was tested on a sample of one hundred and twelve olive jar body sherds that were collected from the St. Johns wreck in 1991. The thickness of each these fragments was recorded. The same was done for an equal number of sherds from the 1622 wreck of the galleon *Nuestra Señora de Atocha*. Indeed, there was a difference: those from the St. John's Bahamas wreck averaged 8.4mm while those from the *Atocha* had an average thickness of 10.2mm, which falls in line with Goggin's idea that earlier, sixteenth-century jars were more lightly constructed than those from the seventeenth and eighteenth centuries (Fig. 11.10).

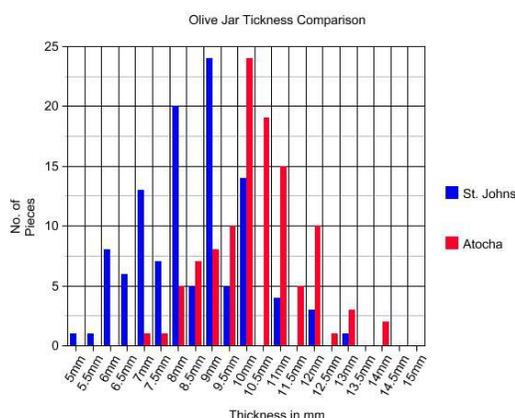


Figure 11.10. Thicknesses of olive jar body sherds from St. Johns Wreck and 1622 galleon *Nuestra Señora de Atocha*

Historical documents suggest that olive jars were made in and around Seville, especially in the adjacent community of Triana (Marken, 1994:48), and this idea is certainly reinforced by scores of Indies ships leaving from the Guadalquivir River for the Americas freshly-laden with *botijas*. Recent research into the chemical composition of early olive jar remains found in Colombia indicates that the jars were indeed produced in Seville and Triana (Gomez Ferrer, et al, 2013). Though analysis of late sixteenth-century olive jar fragments found in the Pacific Ocean's Solomon Islands suggests those specimens were made in Peru (Kelloway, et al, 2014).

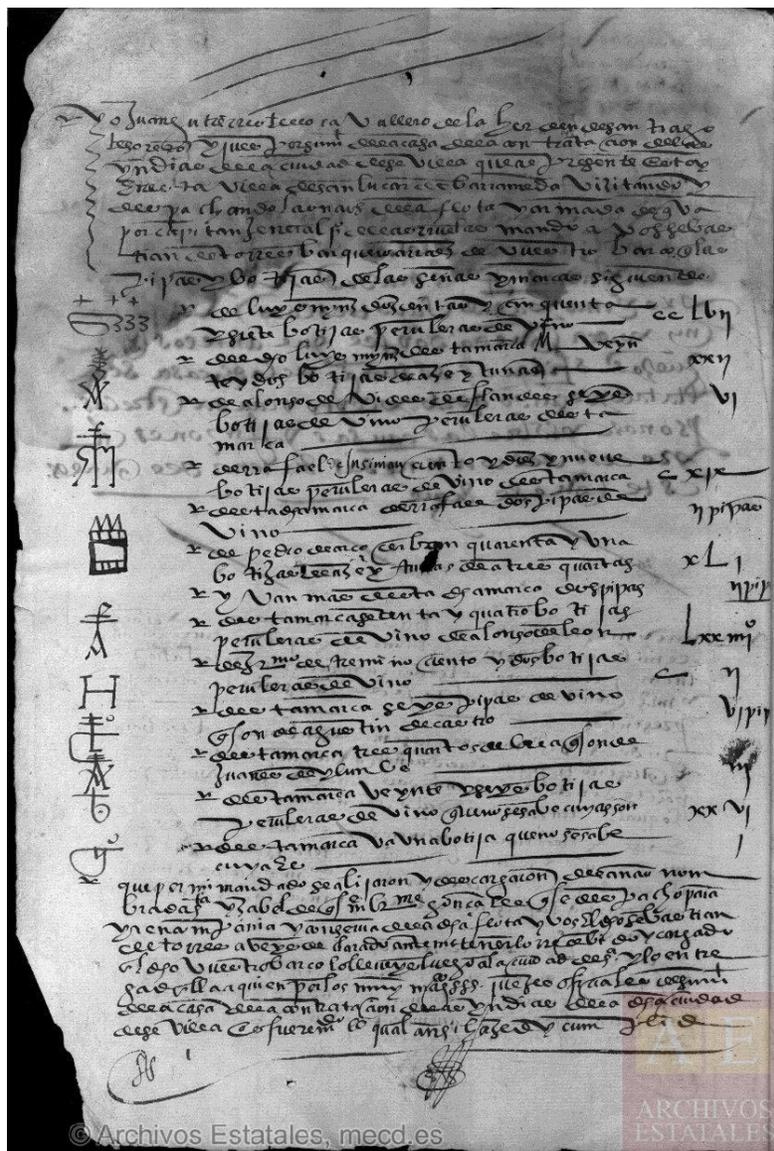


Figure 11.11. An entry for jars (*botijas*) of wine and olives sent on the ship *Santa Isabel* to Nombre de Dios, 1561. The drawings in the left-hand column depict the shipper's marks that were put upon jars. (Archivo General de Indias, Justicia, 811, N.3, f7V).

Early images of olive jars in use in the Spanish colonies show that they were used to disperse contents further afield and were also used as household or workspace containers (Figs. 11.12 & 11.13), in line with the idea that amphora-type containers were not only for shipping, but served as packages for consumer use, too (Twede, 2001).



Figure 11.12. (L) *Capítulo De Los Maiordomos*: Depicts a Spaniard beating a wine-carrier who is loading two *botijas* onto a llama. (R) *Don Juan Capcha, Indio*, with a *botija* of *vino añejo* (aged wine) and a large, Native-style jar for the Inca drink *chicha fresca* (Guaman Poma de Ayala, 1615, *Nueva Corónica*, f524 & f776, Royal Library, Copenhagen).

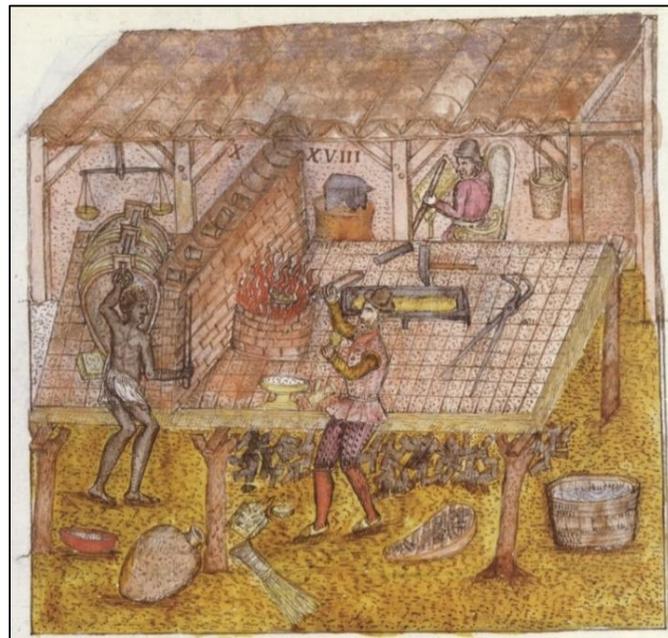


Figure 11.13. A Spanish Forge with a *botija* in the foreground, (Anonymous, ca. 1590, *Histoire Naturelle des Indes*, f.102, Pierpont Morgan Library, New York).

Majolica

The second most prevalent ceramic-group present on the St. John's wreck is another variety of earthenware known as majolica. The buff-white to terra-cotta paste of this type of ware is softer and finer than that of the olive jars, with a chalkier quality and little visible temper. Some of the St. Johns sherds have remnants of majolica's distinctive tin-based "glaze" that is generally white or off-white, ranging into blue. This coating, a combination of glass, lead oxide, and tin oxide, is actually considered enamelling, because it is opaque, as opposed to glazing, which is clear or translucent (Barber, 1906:5; Goggin, 1968:3). The vessels made in this style tend toward tableware and those of more specific utilitarian function. There are many stylistic varieties of majolica found from the Spanish colonial period, and these long been known to have changed through time and locale (Barber, 1908:104-107; Goggin, 1968:25-27), and these changes provide archaeologists an important medium with which to help interpret sites. The varieties of majolica seen on the St. Johns site are almost all of simple and plain varieties exhibiting virtually no decoration other than a basic enamelling. The majority fall under the Hispano-Moresque tradition, which began a rapid decline after 1609, when the last of the Moors were expelled from Spain (Goggin, 1968: 6).

Columbia Plain

Marken made the observation that, after olive jars, a type of majolica called Columbia Plain is the second-most common ceramic found on Spanish colonial archaeological sites, whether at land or at sea (1994:139). The statement holds true for the St. Johns wreck, where sixty-four Columbia Plain sherds have been recovered. Columbia Plain is defined by its cream to terra cotta colour and soft, fine, chalky paste with a whitish tin-enamelling, sometimes with a green over-glaze, with relatively thick walls (ca. 7 to 13 millimetres) and crudely finished construction, oftentimes with visible flaws (Goggin, 1968:117-118; Marken, 1994:139-140). Columbia Plain has its origins in medieval, Moorish Spain, but the type also transitioned into the Christian-era (Lister and Lister, 1976:108), and historical documentation shows this type was most likely produced in the Greater-Seville area during the colonial period (Goggin, 1968:124-125). The type is named, though, after Columbia County, Florida, its place of first archaeological description (Goggin, 1961:26).

On the St. John's Bahamas site, the collection of Columbia Plain fragments is composed largely of the remains of crude, brimless *platos* (plates) and *escudillas* (cup-like bowls). Two other pieces come from a straight-sided round vessel, and a round and flat-bottomed piece, both likely the remains of chamber

pots. Another is a fragment of a straight-sided rim that mounted on an unidentified bulbous vessel form. The enamelling on the St. Johns vessels, where it survives at all, is in very poor condition; just three pieces show a greyish, cream-white enamel that is poorly attached and thoroughly cracked with a network of fine lines.



Figure 11.14. St. Johns Columbia Plain *platos*. Photos of the interior and exterior of plato 92-1085 and reconstructive drawings of *platos* 92-1085, 92-0946/95-1900, and 95-1774.

Fifty of the fragments originated from at least nine *platos*, with enough surviving from three of the vessels to allow the reconstruction of their whole forms (Fig. 11.14). The diameters for these reconstructed *platos* range from 19.8 centimetres to 21.6 centimetres. Eight sherds exhibit inset, concave bases, and seven have remains of a raised, dome-like "button" at the interior centre. Nine *plato* sherds have a raised ring circling the interior, roughly one-third of the way from the centre towards the rim. The most complete *plato*, 92-1085, has no distinct domed button at the interior centre.

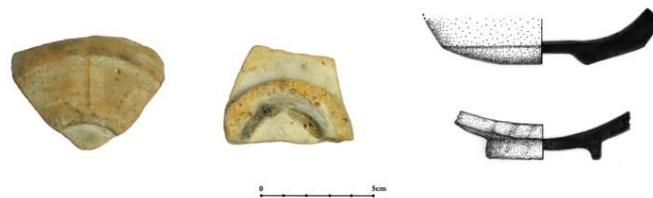


Figure 11.15. Two Columbia Plain *escudilla* bases, one inset, one ring-footed.

Fragments of smaller Columbia Plain vessels called *escudillas* give important details for the forms of the cup-like bowls used on board the ship. Two pieces are from bases, and they show two forms: one is an angled body leading into an inset base, and the other was set on a pronounced ringed-foot. None of the

sherds allows for a complete reconstruction of the vessels, but large enough portions of two bases have survived to allow partial reconstructions (Fig. 11.15).

Columbia Plain *platos* and *escudillas* underwent stylistic changes that are indicative of the time in which they were produced, and the design of the St. Johns pieces allows them to be dated. Goggin found the central, domed- boss of the *platos* coincided with earlier dates (1968:120-121), while those without came later, and in subsequent research, Marken reaffirmed this trend (1994:152). Goggin divided the changes in plate design into two periods, an early one from 1492-1575, and a later one from 1575 to ca. 1650 (1968:117). Deagan noted two eras for Columbia Plain *platos* as well, but with a slightly earlier shift between them – the early ranging from 1492-1550 and the later from 1550 to ca.1650 (1987:57). The type of base used in the design of *escudillas* has also been observed to have changed through time, with the inset variety appearing before those with a footed base; the transition in form occurring by the early to mid-1500's (Boone, 1984; Goggin, 1968:121), although archaeological evidence from Seville suggests this shift might have occurred later, in the second half of the sixteenth century (McEwan, 1992:99) The presence of Columbia Plain *platos* predominantly with, but also without, the diagnostic central boss, would suggest that the St. Johns collection falls into the period of transition. The same is true for the *escudillas* from the shipwreck: to have both inset-base and ring-footed varieties on the same ship would be most likely if it sailed near the mid-century period of transition.



Figure 11.16. Italianate, white-ware *plato*.

Nine sherds of what are referred to here as "white-ware" represent the second most numerous majolica variety found on this site. This type is distinguished from the Columbia Plain by its more elaborate and modern-appearing vessel forms, generally thinner vessel walls, and a thicker, more resilient enamelling over carefully finished surfaces. There is no evidence of decoration over the plain, greyish-white enamel. The paste for this ware falls into two varieties: one being virtually identical to that of the Columbia Plain, and the other of a more reddish colour. This reddish type is also harder and denser, and the sherds

made from this paste have suffered much less abrasion from the sandy, underwater environment of the wreck site. The major part of a concave-based plate with a slight foot-ring and a flat, flaring brim is the most prominent piece of white-ware from the site (Fig. 11.16). The plate's interior surface is smooth and marred only by triple scars near the centre, scars left by spacers placed between vessels during firing. Three other *plato* sherds, including a piece of a smaller-sized flat brim are all made of the same, harder paste and all maintain their whitish-grey enamel. A lobed handle from a 4-millimetre-thick *escudilla* is made of a paste that is similar to the plate fragments, but its enamel has degraded to a darker, mottled grey, possibly the result of degradation in the seawater (Fig. 11.17). Another piece of white-ware, but made of the softer cream-colored paste variety, is the base of a *taza* (pedestal-footed cup or bowl).



Figure 11.17. Lobed *escudilla* handle and rim fragment 91-0020 (L) and reconstructive drawing (R).

Similar, plain, white-enamelled earthenware types have been defined from other colonial-era archaeological contexts. One variety, termed "Sevilla White," is believed to result from Spanish potters being influenced by Italian Faenza wares; this type dates from 1530 to 1650 (Deagan, 1987:61-62). Lister and Lister (1978) noted two classes of Renaissance-inspired white-ware from sixteenth-century Mexico City, found with either light or reddish paste. A comparable variety of white ware from Panama, but with a distinctive brick-red paste, is also known. Similar flat-brimmed, white *platos* have also been found on wrecks from the Spanish Armada of 1588, with those examples having almost certainly been produced in Spain (Martin, 1979).



Figure 11.18. Three pieces of fine earthenware with thick glossy-white enamel are possibly Italian *faenza*.

Evidence of true Italian majolica might also have been found on the St. John's wreck in six sherds that appear to be of the Faenza variety. These pieces are distinguished from the other St. John's white-ware by their thin walls of yellow-cream coloured paste, elaborate forms (including knobs and small, cup-like appendages), and an enamel that is markedly thicker, glossier, and whiter than any others in the collection (Fig. 11.18). There is no evidence of decoration over the glaze. Similarly described Italian Faenza called "Faenza White" has been found to date to the period of ca.1550-1600 in the New World (Deagan, 1987:71). Goggin also describes a "thin white" ware from Concepcion de La Vega in the Dominican Republic, which was occupied from 1495-1562 (Goggin, 1968:28). It might be that this rather vague description indicates the presence of either finer-grade Sevillian or Italian white-ware.



Figure 11.19. Unspecified blue-on-white majolica.

One small majolica sherd appears to be from a *plato*, and it is covered with an oyster-white enamel painted with two thinly-tinted blue marks (Fig. 11.19). The sherd is so small and the painted design so incomplete that it is not possible to categorize this piece any more specifically than "blue-on-white" majolica.



Figure 11.20. Caparra Blue majolica *albarello*.

The only majolica vessel found on this site without a white-based enamel is the lower part of a flaring, cylindrical, ring-footed jar found trapped in the concretion of a mass of iron barrel hoop remains (Fig.

11.20). The surface that was exposed to the elements was heavily abraded, but when the piece was removed, the area that had been protected by the concretion retained its original surface, including evenly-applied, medium-blue enamel. The piece has pronounced throwing marks on its unglazed interior. The narrowed waist and flaring bottom, which would have matched with an equally-flaring top half, is a distinguishing characteristic of the *albarello*, a vessel thought to have its roots in pre-Renaissance Italy, where it was used into the sixteenth century as a drug jar to hold solids, powders, or viscous materials, not liquids (Wallis, 1904: viiii-x). Lister and Lister have found that the *albarello* was also used in medieval, Moorish Spain (1976: 13). In New World archaeological contexts, the *albarello* is the only known vessel form for a Spanish colonial ceramic variety called Caparra Blue (after Caparra, Puerto Rico, site of its first discovery) which is found in the Americas in the period from ca.1492 to 1600; it is believed that those Caparra Blue *albarelos* dating up to the middle of the 1500's are true Italian pieces (Deagan, 1987:62-63).

Lead-glazed Wares

Another significant portion of the utilitarian earthenware ceramics on board the ship are distinguished by their lead-based glazes, and a variety of paste types and vessel forms is found in this group. The lead glazes are clear or translucent and range in colour from golden to brown to green, the colours the result of the interaction of additives or metals in the clay, especially iron, with the glaze in the reducing environment of the kiln (Henderson, 2000:125). On the St. Johns site, these glazes have generally remained more lustrous than the tin-enamels have. Lead-glazed ceramics are found throughout the Spanish colonial period in the Americas, and some, based on their presence at the earliest colonial sites, are clearly of Spanish manufacture, while others are thought to have been made in the Americas, beginning as early as the middle of the sixteenth century (Deagan, 1987: 47-48).

El Morro Ware



Figure 11.21. El Morro rim sherds, front and back, and a reconstructive drawing.

Six sherds of sand-tempered, reddish-tan paste of medium compactness, covered by a thin, clear, rust-coloured glaze with hints of green appear to be “El Morro” ware, a type of lead-glazed earthenware first described by Hale Smith at the site of El Morro, Puerto Rico, and where it might also have been manufactured (Smith, 1962:68-69). Three of the St. Johns pieces all come from a rim with a grooved-design exterior (Fig. 11.21). Two other pieces are from shallow, flat-bottomed bowls or plates. El Morro ware most commonly dates to a period from ca. 1550 to 1600, though examples have been found from contexts possibly as late as the mid-1700’s at St. Augustine, Florida (Deagan, 1987: 51). El Morro ware was found in abundance on the Emanuel Point I shipwreck of 1559 (Mullins, 1998: 135-139), and other shipwreck examples come from the mid sixteenth-century shipwreck site at Ines de Soto, Cuba (Domínguez, 1998:172-173), and the 1622 galleon *Atocha* (Marken, 1994: 196).

Sandy Lead-glazed Red Ware



Figure 11.22. Examples of Sandy, Lead-glazed Redware from the St. Johns Wreck.

Forty-six St. Johns lead-glazed sherds are of a type that appears to be related to the El Morro ware, but they are distinguished from it by a softer, sandier, crumbly, brick-red paste, which in some cases is blackened, apparently as a result of its firing. These pieces are covered with glossy glaze, sometimes found on only one side, sometimes on both surfaces, with colours ranging from a transparent light olive-green to an opaque, dark olive-brown (Fig. 11.22). There are none of the orange-red glaze-tones of the El Morro variety. The St. Johns examples are all from wheel-thrown, round-bodied vessels, although specific forms cannot be determined from the fragmented remains. Arched, moulded handles are also

found in this collection. Deagan describes similar greenish-glazed wares, with soft, sandy, red paste as being confined to archaeological sites from the first three-quarters of the sixteenth century in the New World (1987:50). From maritime contexts, similar examples of this type of ware have been described from the Molasses Reef wreck (Keith, 1987: 248), the 1554 fleet wrecks (Olds, 1976; 139; Skowronek, 1987); and nearly-identical examples are in the collection from the wreck of the 1622 galleon *Nuestra Señora de Atocha* at the Mel Fisher Maritime Museum in Key West, Florida, which broadens the date range for this ceramic variety from the sixteenth to the early seventeenth centuries.



Figure 11.23. Green *Lebrillo* and green-glazed mortar.

A second type of lead-glazed ware is distinguished by its paste, which is similar to that of the majolicas, soft and chalky with little visible temper, and by the distinctive apple green to emerald green glaze that covers it on the exterior, interior, or both (Fig. 11.23). The forms that are represented in this group are mortar, *lebrillo* (pan) and possibly *orza* (rounded drug jar), and an inset base from an unidentified vessel. Many of the *lebrillo* pieces are quite thick – ca. 13 millimetres to 21 millimetres. A smaller fragment from the base of an *albarello* also has a similar, chalky, cream-colored paste; it appears to be largely unglazed, but does show a small section of degraded, green-tinted glaze preserved in a groove near the vessel's foot. This type of ceramic was first described as "Green-glazed basin" by Goggin, who noted that it was found in the form of the *lebrillo*, large (2 to 3 feet in diameter) flat-bottomed vessels with straight, outwardly-flaring sides with heavy, rolled or folded rims (1968: 226). Such a large, tub-like vessel would have had many uses. Deagan notes that this type of green-glazed earthenware is found in other forms, too, especially the *bacín*, or chamber pot, and in her survey of Spanish colonial terrestrial sites found that the type dated from ca. 1490 to 1600 (1987:48-50). A related variety has a green exterior and white, tin-enamelled interior and has been termed "Santa Elena Green and White" from its discovery on the mid to late sixteenth-century settlement at Santa Elena, South Carolina (South, Skowronek, Johnson, 1988: 242-245). Some of the St. Johns sherds may be of the Santa Elena type but with the interior glaze

having been eroded by the sea and sand. Apart from the green glaze, the St. Johns pieces are largely undecorated - the exception being the top edges of the *lebrillo* rims, which were impressed before firing with what appears to be twisted cord by which the strands left a series of regularly-spaced, angling indentations with glaze pooled in them.



Figure 11.24. Fragments of Melado-type *platos*, front and back, from the St. Johns wreck.

The third variety of lead-glazed earthenware found on the St. John's site is a lead-glazed ware known as *Melado*. The paste is quite similar to that of the Columbia Plain majolica, soft and chalky with little visible temper, but the glazes range in colour from golden-honey to olive-brown, sometimes with hints of green. The colour of the glaze is sometimes inconsistent across a vessel. Five sherds have originated from thick-walled *platos* with inset-bases that, from these pieces, look to have had the same general shape as the Columbia plain *platos*, but thicker at 8-17 millimetres (Fig. 11.24). On the interior faces, very near the brim edges and also encircling the central interior of the plates, there are distinct grooves, apparently as a design feature. Eight other *melado* fragments come from smaller, thinner vessels of unknown form. Glazing is present on both sides of those from the *platos*, and the same is generally true for the other sherds. *Melado* was a common ceramic type encountered at La Isabela, most commonly in tableware form, especially *platos* (Deagan and Cruxent, 2002: 160-166). There were four subtypes of *melado* at the Isabela site based on differences in glaze colour and paste qualities, along with nine varieties of related "vitreo" lead-glazed earthenware. Surveys of ceramics from Spanish colonial archaeological sites show that *melado* appears to have seen its greatest popularity during the first half of the sixteenth-century (Goggin, 1968: 227; Deagan, 1987:28).



Figure 11.25. Finer-grade, lead-glazed earthenware.

A single piece of lead-glazed earthenware stands apart from the others in the St. Johns collection in that it has a fine, compact, salmon-to-tan coloured paste and a well-applied (and preserved), clear, glossy, olive-green glaze on the interior (Fig. 11.25). The exterior of the rounded vessel is undecorated except for patches of degraded and crumbly green glaze. Its more-orange paste and resilient interior glaze, distinguish this piece from the other lead-glazed varieties on the site. Though the piece is different from the others, it does seem to fall within a range consistent with the other types found on the shipwreck, and it may simply reflect the variability found in lead-glazed earthenware of the time.

Orange-painted Ware

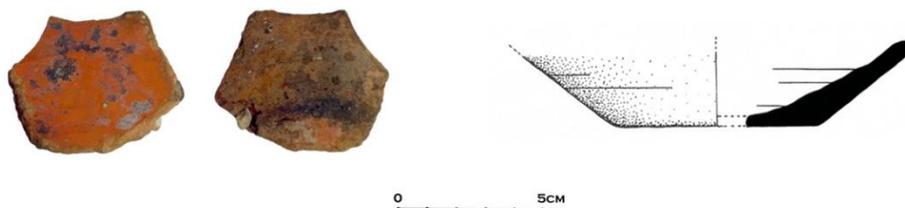


Figure 11.26. Unidentified, orange painted earthenware, possibly of Mesoamerican origin.

A single, unusual piece from an earthenware bowl, covered on the interior with a flat orange-red paint or slip; the brightly-coloured pigment is then mottled with a shiny graphite-coloured paint or glaze, with no discernible design or motif, comes from the wreck (Fig. 11.26). There are slight hints of the same orange colour on the exterior, where there is also evidence of charring. The clay is a fine, compact, orange-terra cotta paste, with large (up to 6mm diameter) white pebble inclusions that appear to be feldspar or quartz. The exterior surface shows fine, linear marks and looks to have been tool-smoothed; the interior is patterned with the ridges and grooves typical of wheel-thrown vessels.

This ceramic type remains unidentified, though it shares characteristics with known colonial-era ceramic types. It looks to be most comparable to “Aztec-tradition Red Ware,” which has orange to red surface treatment sometimes painted with black designs and was produced in Central Mexico until ca. 1625 (Rodríguez-Alegría et al, 2013:400-401). This colonial Aztec Red Ware was utilized by Native peoples but was also adapted for the Spanish market, where there was a want for “Indian” things (Charlton & Fournier, 2011:147-148). The vessel form of the St. Johns piece, a flat-bottomed plate or bowl with flaring sides, is similar to known Mexican-colonial red ware examples (Charlton, Fournier, & Cervantes, 1995:149). Similarly-painted “Aztec Ware” was also found on the Emanuel Point I shipwreck site, a ship that was part of Tristan de Luna’s 1559 Florida colonization effort that launched from Mexico (Smith, Spirek, Bratten and Scott-Ireton, 1995: 101-105). Another, orange-coloured ceramic from Central America is labelled “Yucatan Colonial Ware,” which is encountered, though quite rarely, on late sixteenth-century Spanish-colonial sites, including St. Augustine, Florida. The Yucatan ware is a cream-colored earthenware paste, tempered with limestone, and covered with a thin orange or orange-red slip (Deagan, 1987: 46). The evidence suggests that the St. Johns red-orange painted sherd most likely came from a Mesoamerican source, but because there is only one piece of this type of pottery from the shipwreck, and because it does not unquestionably match with other known ceramic varieties, it cannot be specifically classified.

Unglazed Wares



Figure 11.27. *Bizcocho* jar base.

Three sherds with a fine, buff-coloured earthenware paste, show no evidence of having been glazed. Two of these are bases from relatively thin-walled, flaring-sided, wheel thrown vessels, most likely jars or pitchers (Fig. 11.27). The third piece is a thin-walled rim sherd from a vessel of unidentifiable form. This ceramic type, called *bizcocho*, saw its greatest popularity from 1500 to 1550 in the New World (Deagan, 1987:43). Examples from shipwrecks, though, greatly expand this date range: multiple forms of

bizcocho ware were found on the 1622 wreck site of *Nuestra Señora de Atocha*, and a small collection of *bizcocho* saucers was recovered from the 1724 site of the Spanish vessel *Tolosá*, found near the Dominican Republic (Marken, 1994:207-210).



Figure 11.28. Micaceous ware.

A second unglazed ceramic variety from the site is found as the base of a small, flaring-sided, round vessel made of a brown paste with bits of reflective mica and occasional small pieces of quartz temper incorporated into it. The walls of the vessel are very thin; ca. 2.5 millimetres. The interior walls exhibit an undulating surface typical of a wheel-thrown vessel, but there are also thin, incised lines on all the surfaces, suggesting a tooled-finish, and a thin, raised ring along the perimeter of the base appears to have been made by moulding or scraping. Similar examples have been termed both "Merida Ware," believed to be of Portuguese origin (Martin, 1979), and the related, if not the same, "Orange Micaceous Ware," which is generally quite thin (2-5 millimetres), unglazed, with surfaces that are scraped smooth; it ranges in date from ca.1550-1650 (Deagan, 1987:40-41). There is a variant of Portuguese Red Ware (a name also used in lieu of Merida Ware) called "Coarse Brown-Orange," with mica, quartz and feldspar temper and a brown-orange colour, a description that fits closely with the St. Johns example (Newstead, 2013:142).

Native American or Colono Ware

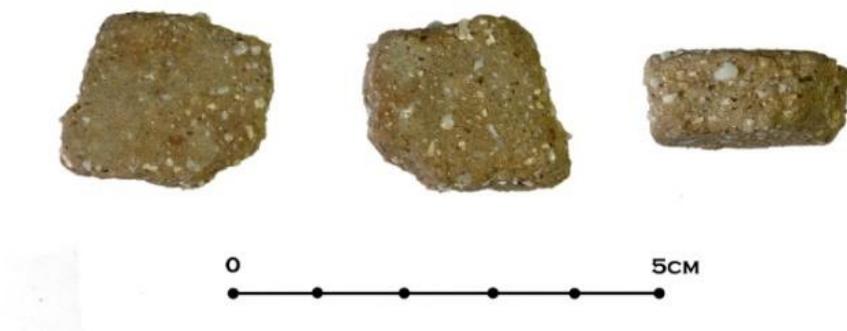


Figure 11.29. Native American or "Colono" earthenware sherd 92-1077b.

A third category of unglazed ware from this wreck is represented by three pieces. One small, 1.0-centimetre-thick body sherd, was initially thought to be from an olive jar, but after conservation it proved to be browner in colour and tempered with large-grained, white feldspar or quartzite sand (Fig. 11.29). It also has a considerably softer, “muddier” quality than the olive jar pieces. The surfaces are smooth and no throwing marks are visible. A larger, second sherd was found trapped in the concretion of an iron artefact; it is also one-centimetre-thick but of a different construction, with a darker brown and slightly harder paste with a sandy, calcareous temper mixed with small bits of quartz. A third piece of less-compact earthenware look to be of yet another type (Fig. 11.30). This 0.9-centimetre-thick sherd is of a light-brown, soft paste tempered with sand and small bits of limestone. The surfaces are burnished to a very smooth dark-brown. All three of these pieces look to have been hand-smoothed with no evidence of wheel-throwing, suggesting they were hand-moulded vessels.



Figure 11.30. Burnished Native American or “Colono” earthenware fragment 92-1140, two views.

Similar ceramic types, termed “Colono Ware,” are found in colonial contexts throughout the Americas, and they are thought to be of Native or perhaps even African-tradition manufacture (Deagan, 1987: 103). There is precedent for Native ceramics on early Spanish Indies ships. The Molasses Reef wreck yielded seven fragments of cruder, non-Hispanic earthenware that was presumed to be of Native manufacture and three pieces of “Palmetto Ware,” a type of Native Bahamian ceramic (Keith, 1987: 252-253). Twelve similar fragments were found on the Ines de Soto wreck along Cuba’s north coast, with two identifiable as round-bodied pots. The Ines de Soto pieces have been described as “ceramics of transculturation,” and are the product of Native potters who maintained their locally-variable traditions under the Spanish colonial system (Dominguez, 1998: 160-161). At least seven Native earthenware vessels with low-fired pastes similar to the St. Johns examples were found on the wreck of the 1622 galleon *Nuestra Señora de Atocha*, and though the vessels are of unidentified origin, at least one *Atocha*

vessel closely matches a native form found in Guatemala (Marken, 1994: 211). An even larger collection of this general type of ceramic was found on the Tortugas Shipwreck, believed to be the *patache Buen Jesus* that sailed in the same fleet as the *Atocha* in 1622. On the Tortugas site, 278 pieces from an unknown number of rounded pots and relatively flat griddles are thought likely to be of African-style manufacture and perhaps evidence of African slaves on the ship (Gerth & Kingsley, 2014). It has been said that handcrafted, low-fired earthenware is most aptly described as “non-elite ware,” the product of both Native and African peoples in the colonies who were not consuming imported European wares but were, instead, making their own, in traditions they were familiar with (Thornton, 2012:350-351).

Heavy Earthenware



Figure 11.31. Three pieces of heavily-constructed earthenware; (L to R) a tightly-curved body sherd, a lug handle, rim sherd.

Another unusual, unglazed, ceramic type-group consists of pieces all very heavily built from a sandy, earthenware paste that is virtually identical to that of the olive jars. The forms are varied within this group: A vessel with a tightly curved, round-form is seen, as is a thick lug handle, and a thick, straight-sided rim, along with undifferentiated body sherds. The vessel walls of these pieces are quite thick; from 2.0 to 3.5 centimetres. In addition to the hollowware, there is an unusual, solid, ring-footed cone of unknown function made of the same paste. The only described parallel to this heavily-built

earthenware is found on the Emanuel Point I ship, where a similar lug handle or vessel foot was found (Smith, Spirek, Bratten and Scott-Ireton, 1995: 105).

Bricks



Figure 11.32. Eight brick fragments from the St. Johns Wreck.

Twenty-four fragments of broken and eroded earthenware bricks have been recovered from the St. Johns wreck. The bricks vary considerably in both size and colour: some are a reddish, terra-cotta colour; others range between tan and yellow. No bricks have been seen with full lengths, but two have intact widths and thicknesses; the largest, a tan brick, is 6.6 centimetres thick and 14.0 centimetres wide; another, a red one, is 4.5 centimetres thick and 9.7 centimetres wide. There are variations in the amount of temper used in the bricks' manufacture, as well. Some show virtually no temper, and others are thoroughly integrated with sand and/or gravel. These bricks might have been used in the construction of a hearth or firebox, though the wide variety, with different pastes and sizes, would mean that any hearth was assembled with little regard for aesthetics. Masonry structures utilizing bricks for

walls and floors were built in the Spanish colonies, and bricks were known to be imported by ships into the American colonies. One early colonial document details one ship carrying some 12,000 bricks to Santo Domingo (Ferdinand II, 1513b). Or, the fact that the bricks are all fragmented and so diverse and might suggest they were broken, unwanted “wasters” that, somewhere along the line, had been mixed into the ballast.

Stoneware



Figure 11.33. Blue-glazed grey stoneware.

One fragment of hard, light-grey paste stoneware with an irregular blue to grey glaze was found. The glaze has a bumpy and pitted, “orange-peel” surface typical of salt-glazing (Rogers, 2002:20). Salt-glazed blue and grey stoneware was first produced in the later part of the 1500’s at Raeren, Germany, with the earliest-known marked piece dated 1582 (Coutts, 2001: 55-56). Deagan notes that German stoneware was one of the few non-Hispanic ceramic-types that could be legally imported into the American colonies in the sixteenth century, and it is found from Spanish colonial contexts, but only in brown varieties that were likely produced at Cologne (1987: 103). Brown stoneware has been found on *Carrera de Indias* ships, including the 1554 wrecks (Arnold & Weddle, 1978: 262) and the Emanuel Point I site of 1559 (Smith, et al, 1998: 122). Given the relatively late date for the production of blue, salt-glazed, grey stoneware, and the lack of other examples from any other sixteenth-century Spanish colonial sites, it appears doubtful that this piece was part of the St. Johns ship, and it is most likely intrusive from a later period.

Clay Pipes



Figure 11.34. Clay pipe fragments. From Top: 96-2042, 95-1893, 95-1822, 99-2714, 95-1907. Bowl fragments: 95-1838 (top), 99-2705 (bottom).

Seven clay pipe fragments were a very surprising discovery from this ship because these are not usually encountered in such an early context. The clay of all of these stem and bowl pieces is very fine grained and smooth. Two of the stem sections and the bowl fragments are of greyish-white clay, presumed to be kaolin, but two other stem fragments have significantly different, yellow to reddish-brown tones. The stems have mould seams running along two opposing sides of their length and these appear to have been shaved or rubbed smooth in some areas. One example has a moulded decorative design encircling the stem. The larger bowl fragment is 4.1 cm deep and angles into the stem at roughly a 45-degree bend; it does not have a pronounced heel at this juncture.



Figure 11.35. The first known illustration of a European tobacco pipe (from Chute, 1595:12).

The smoking of “herbs” was first encountered by Europeans in 1492, when Christopher Columbus observed Native Americans inhaling smoke, and the first direct mention of tobacco appeared in 1535, when Bartolomé de las Casas wrote that the Indians smoked dried leaves via rolled paper tubes called

“tabacos” (Navarro, 2000). By mid-century, the tobacco plant was being cultivated by the Spanish in areas of Cuba, by the Portuguese in Brazil, and in 1556, it is known to have reached Europe, when the Frenchman Jean Nicot successfully raised seeds given to him by a Portuguese ambassador (Guarnido Olmedo, 1983). By 1565, the Sevillian doctor Nicolas Monardes was espousing tobacco as a powerful medicine capable of curing a variety of ailments, and his writings only increased European interest in the plant (Gately, 2001: 40-41).

Clay tobacco pipe fragments have been found at the sixteenth-century Spanish colonial town site of Puerto Real in present-day Haiti, but these have been considered to be intrusions from later periods (Williams, 1995:130). A relatively large, reddish-clay pipe bowl designed to hold a reed stem was recovered from the lower hull complex of the *Nuestra Señora de Atocha* of 1622, and seven clay pipe stems were found on the Tortugas site, believed to be the *Buen Jesus* also of 1622 and sailing in the same fleet as *Atocha* (Sudbury and Gerth, 2014: 229). The pipes from the two 1622 sites came from secure contexts and were not intrusive.

The stems of the St. Johns pipes are all broken, and little can be said about their original length, but the diameters of the bores running through these stems are observed to have diminished consistently through time, and have been a successful measure for arriving at a date of the pieces (Harrington, 1978) (Fig. 11.36).

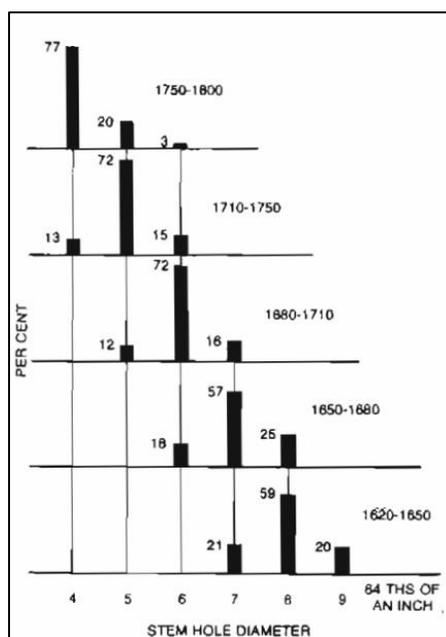


Figure 11.36. Average clay tobacco pipe stem bore diameter changes through time (Harrington, 1978:64).

The diameters of the St. Johns pipe stems are varied:

| | |
|---------------------------|-----------------|
| 95-1893, white; rouletted | 3.1 millimetres |
| 95-1907, white | 2.8 millimetres |
| 95-1822, red-brown | 3.9 millimetres |
| 99-2714, tan-brown | 3.5 millimetres |
| 96-2042, white | 2.2 millimetres |

In aggregate, these diameters total 15.5 millimetres (0.6102362 inches), which averages to 3.1 millimetres per pipe (0.122047 inches). Harrington's chart is based on a measure of $1/64^{\text{th}}$ of an inch (0.015625 inches), and when 0.122047 is divided by this, a figure of $7.8/64^{\text{ths}}$ of an inch average bore-diameter is derived, which, using the table, places the St. Johns collection very near the middle of the seventeenth century.

A second formula for calculating the dates of pipe stems based on their diminishing bore diameters through time was developed by archaeologist Lewis Binford, who came up with formula $Y=1931.85-38.26X$. In this equation, Y is the calculated date of pipes being studied; 1931.85 is the year at which bore diameters would theoretically reach zero; and 38.26 is the interval in years between each $1/64^{\text{th}}$ inch increment. Applying this formula to the St. Johns collection reveals a date similar to that derived using Harrington's chart: $1931.85-38.26(7.8) = 1633.422$, and both dates – mid-1600's and 1633 – are well outside what would be expected of items originating from the St. Johns wreck. Despite the fact that some of these pipe fragments were found in a seemingly good context alongside sixteenth-century materials, this analysis shows they are most likely intrusive.

English Astbury Ware

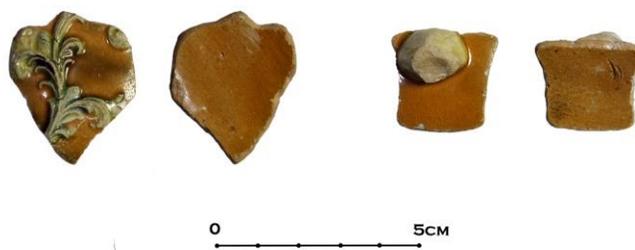


Figure 11.37. English "Astbury" earthenware with moulded appliqué.

Two pieces of finely-made, lead-glazed earthenware are made of a golden-brown paste with cream-colored, moulded appliqué surface treatments, including scrolling vines and what appears to be the

attachment point of a handle. These pieces come from a bulbous vessel with walls 3 millimetres thick. Both pieces are covered in a transparent, lightly-tinted green glaze. These pieces do not correlate to any published descriptions of early Spanish-colonial ceramics, but instead appear to be early-to-mid eighteenth century English “Astbury ware” (Hobson, 1904:45-46; Noël Hume, 1991:122-123). Like the pipes and the blue-grey stoneware, these ceramic pieces are intrusive to the St. Johns site.

Conclusions

The St. Johns wreck has a large and varied collection of ceramics. The group is dominated by a large collection of earthenware *botija* or olive jar remains. These large, egg-shaped jars were likely being used on the ship to carry wine, oil, vinegar, or other consumables during the voyage. Only one size of olive jar the *botija perulera*, or a “type A” jar according to John Goggin’s landmark study, has been identified from the St. Johns site. But, judging from other historical records and other archaeological sites, other sizes, especially the smaller *botija de media arroba*, are likely to be found as the many fragments are cross-mended. The jars might also have been part of a cargo of Spanish products to be sold to New World colonists, where even the jars themselves could have been the product. The St. Johns remains, unfortunately, do not offer any clues to their contents.

It has already been noted that García de Palacio recommended ships carry 100 *botijas*, or olive jars, for water, but he also listed other ceramic vessels in his suggested shipboard items: a large earthenware jar or tub for preparing beverages, two other large earthenware jars or tubs, an earthenware pan, twelve *tazas* [small, cup-like bowls], and clay dishes for the service of the crew (tin and wood also acceptable) (1587 [1993]:308). García’s list overlaps with the identified vessel types found on the St. Johns site, which include plates, *tazas*, chamber pots, mortars, drug jars, and large pans. These were supplemented by other jars of unknown function and other unidentified, bulbous vessels. None of these vessel types was found in a number that would constitute a cargo, and it appears that they were for use on board the ship. The ceramic vessels that have been identified would have allowed the people on board the ship to store, prepare, and serve food, relieve themselves privately, wash their bodies and perhaps their clothes, and store medicines. A collection of earthenware brick fragments might have been part of the ship’s firebox or hearth (though other uses are possible).



Figure 11.38. The typical, everyday use of ceramics in colonial-era Spanish culture. Here, a woman cooks eggs in an “El Morro”-type bowl on top of an earthenware brazier. A Columbia Plain *plato* and lead-glazed and majolica pitchers stand on the table. This scene would not have been out of place on board the St. Johns ship. (Diego Velázquez, *Vieja friendo huevos* [Old Woman Cooking Eggs]. 1618. National Galleries of Scotland).

All of the St. Johns pottery pieces are made of earthenware, and they are found as Spanish and Italian tin-enamelled majolica; Spanish and possibly American-colonial lead-glazed wares; unglazed Spanish and Portuguese types; and Mesoamerican and other Native American or African pieces - all areas and cultures that reflect Spain and its early colonial system. Also, all evidence indicates that, as a group, the pieces date to the middle of the sixteenth century: Early, Moorish-influenced ceramic types such as Columbia Plain are found in styles – domed-button centre plates, and inset-base *escudillas* – that are typical of the earliest types known in the Americas, and they are found alongside smooth-centre plates and ring-footed vessels that came into being in the middle part of the century. These Moorish influenced pieces are also found alongside later, Italianate-style white ware forms, something that did not happen until the middle of the sixteenth century. The numerous olive jar remains found on the site have features that are typical of a transition between “early” and “middle” period jars, and they coincide most closely with examples found on other mid sixteenth-century archaeological sites. There

are a few later, non-Spanish ceramics that are intrusive and most likely washed into the site from a nearby shipwreck thought to be of Dutch origin that dates to the late seventeenth century.

The St. Johns ceramic collection is large and varied and it, as much as any other group of objects, tells of the ship's functions, the on board lifestyles, and the early melting pot of cultures that was the sixteenth-century Spanish colonial empire.

Chapter 12: GLASSWARE

Some of the more delicate and fragile objects found on the St. Johns wreck are the remains of a small number of glass vessels. These items are represented by fifty-one pieces of glass representing the remains of vials, and other, unidentified vessels. The most prevalent colours are shades of aqua-green, blue, and grey. Small bubbles are found in most of the shards and fine striations are common on the surfaces. Many pieces of darker green glass are found, too, but there are doubts about their having originated from the wreck.



Figure 12.1. Diver with the base of a small glass vial shortly after its discovery on the St. Johns wreck. (Photo: Don Kincaid/MFMHS).

The remains of three vials – two flaring bases and one mouth – are perhaps the most significant pieces in the group. Portions of two delicate cylindrical vials have thick bases leading into very thin, flared bodies or mouths. Both are of a light-green colour, and one incorporates ribbing as a design element. Their unusual, delicate design offers little indication of their function. The neck and mouth section made of a distinctive light-blue glass is all that has been found of a third vial.



Figure 12.2. Vial Base 92-0958.

Glass vial 92-0958 is an aqua-green with heavy, 1.1-centimetre-thick base that flares broadly into a very thin form (Fig. 12.2). As it flares, the form is decorated with a slightly spiralled ribbing. The piece is 7.8 centimetres tall, and the outward curvature represents a flare of 5.0 centimetres (though this is incomplete).



Figure 12.3. Vial Base 91-024.

Vial 91-024 has a colour and flared form similar to vial 92-0958, but it is less heavily-built (Fig. 12.3). It is made of an aqua-green glass and is 4.9 centimetres tall. This vial flares at its broken top to a maximum of 3.2 centimetres diameter.

One piece of thin, light-green glass has many bubbles in the metal and faint ribbing on the striated exterior surface (Fig. 12.4). Its colour compares favourably in colour and design to the two vial bases and the piece appears to be a body fragment from one of them, or a similarly-made piece.



Figure 12.4. Vial fragment 95-1663.

The complete form of these vials is unknown, but a vial recovered from an early Spanish colonial context offers a suggestion (Fig. 12.5). The vial does not have good provenance, but its form and what is known

about it makes the piece intriguing enough to warrant mention. The piece was sold at auction in the US in 2013, and its current whereabouts are unknown. It is described as having come from an unnamed Spanish colonial terrestrial site in the southern Caribbean dating to the 1500's (Sedwick, 2015). In a side-by-side comparison between St. Johns vial 92-0958 and the Caribbean vial, the two pieces are virtually identical to the point where the St. Johns piece is broken.



Figure 12.5. St. Johns vial 92-0958 (L) and glass vial from 1500's Spanish colonial Caribbean-area land site (R, Photo courtesy Daniel Frank Sedwick, LLC, 2015).

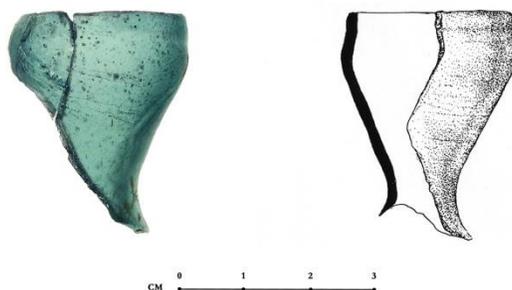


Figure 12.6. Aqua blue glass vial rim 92-1056b. Drawing: Robert Cummings/MFMHS.

A richly-tinted light blue mouth from a vial is filled with bubbles and its exterior surface is covered with fine striations (Fig. 12.6). It is 2.5 centimetres in diameter; the glass is 2.9mm thick. At 2.2 centimetres from the mouth, the constricted neck begins to flare outward to the missing body of the vessel. Its form matches closely with the mouth of the Caribbean vial depicted in Figure 12.5.

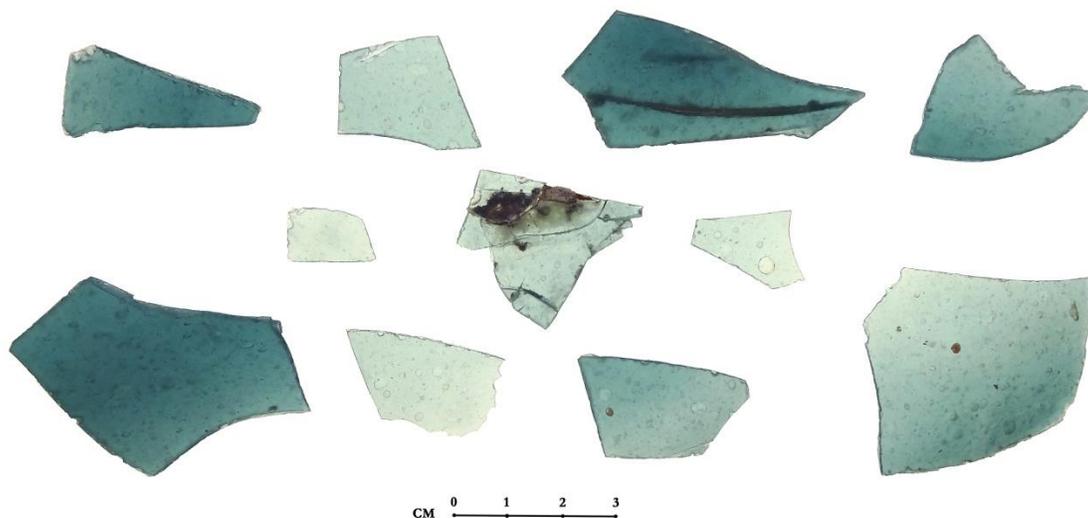


Figure 12.7. Blue glass fragments.

Eleven apparently-linked, blue glass fragments were recovered from across the shipwreck site. The qualities of these shards match so closely, they all look to have come from the same vessel (Fig. 12.7). Aside from a common shade of blue (which varies in intensity based on thickness) the pieces have a dull “frosted” surface and fine bubbles throughout the glass. All of the pieces in this group are curved body shards, indicating they came from some sort of bulbous vessel. The pieces range in thickness from 4.5 to 0.5 millimetres.

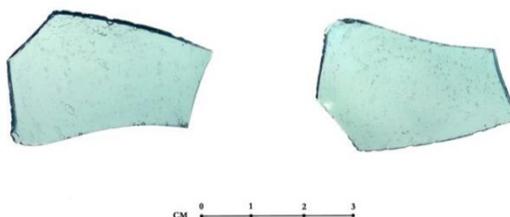


Figure 12.8. Light blue glass fragment, two views.

Another piece of light blue glass is made of a very well-preserved, clear, bubble-filled metal. The surface is glossy (Fig. 12.8). The type of vessel that the piece came from cannot be determined, but it does have compound curves, indicating that it was some sort of bulbous vessel. This is the only piece of glass of this particular type to be recovered from the St. Johns wreck.



Figure 12.9. Clear aqua-green glass fragments.

Two pieces of clear, aqua-green glass are well-preserved and have a modern appearance to them, but each piece was recovered from undisturbed areas in two different excavation units, suggesting they are not intrusive and original to the shipwreck. The two pieces match to form a tight curve that looks to be the rounded neck of a bottle (Fig. 12.9). These two pieces each have a small number of bubbles in the metal, but fewer than in other pieces from the site. The shards are 2.0mm thick, and their colour is similar to that of modern cola bottles.

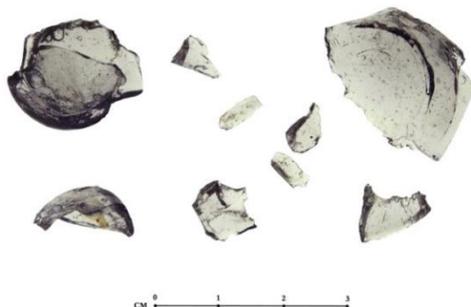


Figure 12.10. Gray glass fragments.

Nine small fragments of gray-tinted, clear glass (99-1298) came from inside the barrel of bombardeta 99-2798, and they look to have all come from a single piece that was broken by a drill bit removing concretion from the gun's bore during conservation in the laboratory (Fig. 12.10). Attempts to cross-mend these pieces have not been successful. The glass of these pieces contains many small bubbles, and the original outside surfaces have fine striations. Some of the fragments are rounded and once covered a small void, as if the piece might have been a hollow knob or base roughly 2 centimetres in diameter and 1.5 centimetres tall.



Figure 12.11. Dark-green glass fragments.

A number of dark olive-green fragments from heavily constructed vessels are found. None of these pieces was found in a good context on the wreck site – almost all came from the sand covering the site, or were exposed on the surface of the seabed (Fig. 12.11). The circumstances of their recovery make it unlikely that these pieces are from the wreck, but they do warrant description, nonetheless. These pieces are well-preserved and have relatively few bubbles in the metal and only some pitting and striations on the surfaces. They range in thickness from 1.0 to 4.0 millimetres thick.



Figure 12.12. Mid-olive green Glass Fragments.

A second group of lighter, olive green glass fragments come from thinner, cylindrical or bulbous vessels. These pieces have a number of bubbles; some are slightly degraded, with a thin layer of decomposed

glass on their surfaces. These pieces are shaded similarly to two later-era bottles found on the site, but at least one piece looks to have come from a different form.

The earliest dated examples of dark, olive-green Spanish colonial glass are found on two shipwrecks from the 1622 Tierra Firme fleet wrecked at the Florida Keys, where the remains of square liquor bottles were found at the wreck of the galleon *Nuestra Señora de Atocha* and the Seahawk I site, believed to be the smaller patache *Buen Jesus* (Malcom, 1990; Gerth, et al, 2013). At those sites, medium to dark green square glass bases were associated with threaded lead collars with separate screw-on caps that fit over the mouths of the bottles. Some of the St. Johns green glass could conceivably be body shards from similar bottles, but no square bases or straight sides, or metal collars or caps have been found on the site. The curvatures and generally-higher thicknesses of the St. Johns pieces indicate that they more likely came from rounded and more heavily-built, dark-green liquor and wine bottles typical of later colonial periods (Noël Hume, 1991: 62-69).

A clearly-intrusive, intact, cylindrical, green bottle was found at the southern extreme of the excavation, and a base of a second, similar example was found buried in the sand covering the site (Fig. 12.13). Both examples have deep punts on their bottoms. A parallel form for these bottles, including the color and bubbled metal, is identified as a French Bordeaux style from the mid-nineteenth century (Van den Bossche, 2001:322). All evidence indicates these bottles are not from the St. Johns ship and were deposited sometime after the wreck had occurred.



Figure 12.13. Two mid-nineteenth century bottles.

The pieces of glass recovered from good archaeological contexts on the St. Johns wreck appear to have come from utilitarian forms, chiefly vials, and possibly bottles. The colours of these vessels generally range between aqua-green and aqua-blue, though a grey-tinted glass is also found. Bubbles within the glass and fine striations on the surfaces are frequently seen on the St. Johns shards, apparently by-products of the glassmaking process. The only indication of purposeful decoration is in the fluted-ribbing found on two pieces. There are no non-essential, decorative appendages.

A survey of sixteenth-century Spanish ship's manifests shows glassware being carried for trade to the Indies, but the types listed are rather vague, showing only sandglasses, Venetian crystal, large crystal mirrors, large round mirrors, Toledo mirrors, and, generically, "glassware" [*vidrios*] (Torre Revello, 1943). Glass from early colonial-era Andalusia has been described as quite distinctive from the more ornamental, Venetian-influenced Castilian or Catalonian pieces, in that those from the southern province of Spain were chiefly functional, everyday forms showing more of an Islamic influence than Venetian (Doménech, 2004:109). Considering that the merchants of Seville had a monopoly on trade with the Indies through the sixteenth and seventeenth centuries (Seavoy, 2003: 23-24), it would be likely that most of the glass found in the early Americas, whether from land sites or shipwrecks, would have come largely, if not solely, from the greater Seville area. Deagan has surmised that a Seville origin for early Spanish colonial glass makes sense out of sheer pragmatism: carrying glassware any significant distance overland to the Indies-bound ships would not only have been expensive, but likelier to damage such a fragile product (1987: 128). It should be noted that a nascent glass industry did exist in the Americas early to mid sixteenth century, with a glassmaker named Rodrigo de Espinosa listed as working in Puebla de Los Angeles, Mexico in 1542 and 1557 (Cruz, 1959). Also in 1557, another glassmaker named Juan Rodriguez was granted royal permission to travel from Spain to Mexico to practice his craft (Philip II, 1557). The types of wares made by these early glassmakers at Puebla have not been identified, though the colors produced there are said to have ranged from clear to green to blue (Toussaint, 1967: 270). It is not known if any of these early, American-produced wares found their way on board the Indies fleets.

Many of the pieces found on the St. Johns wreck compare favourably to glassware found at other early Spanish colonial sites, but glass from other sixteenth-century Indies shipwrecks is relatively uncommon. The bases of two aqua-green glass vials and a small emerald-green, glass bead were the most distinctive pieces found on the Molasses Reef shipwreck site, though nearly 70 unidentifiable fragments were also found; some dark-green pieces thought to be intrusive (Keith, 1987:255-257). The Molasses Reef

wreck's vial bases are quite similar to the two from the St. Johns wreck, especially vial 91-024. On the Emanuel Point I site, dating to 1559, one fragment of thin, aqua-green glass and a piece of thicker, amber-coloured glass were found (Smith, Spirek, Bratten, and Scott-Ireton, 1995:119). Two pieces of bubble-filled glass – one green and one clear – were recovered from the Ines de Soto site off northwest Cuba, but they were too small to determine what type of vessel they came from (Escobar Guio, 1998: 204-205). The reason for the scarcity of early-colonial maritime glass is not clear; perhaps it is nothing more than a reflection of poor preservation of a fragile material in a generally dynamic environment.

Vials bases like those of the St. Johns wreck are also found from the archaeological excavations of a number of early Spanish colonial land sites, including Nueva Cádiz, Venezuela; Puerto Real, Haiti; and Panama Vieja, Panama (Deagan, 1987:136-137). Because all of these sites have early sixteenth-century components, and these vials are not seen on any sites without such an early date, it is thought the forms are indicative of an early 1500's date (*ibid.*). Fragments of ribbed glass have been found at the Spanish settlement of Santa Elena in South Carolina, occupied from 1566 – 1587 (South, Skowronek, and Johnson, 1988: 25-26).

The remains of a minimum of seven glass vessels are represented from good archaeological contexts on the St. Johns wreck; all of them vials or small bulbous bottles. Other forms of glass from the site appear to be the intrusive pieces of rounded-form, olive-green bottles. Some of these might have originated from a nearby late seventeenth century Dutch wreck located some 400 meters to the south. Two examples of bottles date to the mid-nineteenth century and are clearly intrusive.

A small, bulbous vessel that looks to be the intact form of one of the St. Johns vials, suggests the shipwrecked piece would have originally been suitably designed to hold precious liquids such as perfumes or medicines. The other excavated pieces suggest similarly-sized, delicate forms, perhaps all of similar function. What is not clear is if the recovered glassware was being used on board the ship or if the pieces are the remains of a cargo carried across the Atlantic from Spain to the New World colonies.

Chapter 13: COINS AND SILVER

No significant cargo of treasure has been found at the St. Johns wreck, but six coins – four of silver and two copper – and three irregularly-shaped bits of silver have been discovered. Though it is not a large sample, the collection of money is important in many ways: it helps to cement the nationality of the ship, areas to which it sailed, and, most importantly, it establishes a *terminus post quem* for when the ship could have wrecked.

Copper Coins

Of the two copper coins that have been discovered, one is identifiable, the other is not.

The first copper coin, 96-2126b, was corroded and lost some of its circumference, but enough survives to see that the coin was originally 2.8 centimetres in diameter (Fig. 13.1). One face of the piece has been obliterated by both mechanical damage and corrosion. No mintmark survived, but one side of the coin bears a crowned lion, and the design of this lion gives enough information to determine the origin and general date for the coin.



Figure 13.1. Copper Coin 96-2126b.

The lion is a rampant lion, the symbol of the Spanish kingdom of Leon. It is crowned, surrounded by looped scrollwork, and encircled by dotted beadwork. Near the edge of the coin there is a partial legend. Close examination of the lion's body form, the design of the crown, and the specifics of the scrollwork show that the coin matches the copper 4-*maravedis* coins minted in Seville during the 1474-1504 reign of Ferdinand and Isabela (Calicó, Calicó, and Trigo, 1988:60) (Fig. 13.2).



Figure 13.2. An example of a well-preserved 4-maravedis coin made at Seville during the reign of Ferdinand and Isabela (Calicó, Calicó, and Trigo, 1988:60, tipo 215).

A second copper coin was found trapped in the encrustation of an iron cannonball (Fig. 13.3). It is 2.4 centimetres in diameter. On each side, it has dotted beadwork that encircles central motifs, and a legend runs along the edges, outside of the beadwork, but none of these designs can be deciphered. The coin remains unidentified.



Figure 13.3. Unidentified Copper Coin 97-2377b.

Silver Coins

The coins are small and look to be in denominations of one and two *reales*. Attempts were made to conserve two of these coins, which only showed they had been almost completely corroded by their long immersion. The other two have yet to be cleaned. In the case of the first conserved piece, the encrustation was removed manually, and the coin simply crumbled in the process. The second coin was partly de-concreted and placed on an electrolytic reduction system, but it quickly became apparent that this would only cause the important surface details to be lost, so it was removed. Fortunately, alternative methods could be used to determine and document at least some of their numismatic information. Castings were made from the impressions of one coin's surface that were preserved in the encrustation. These casts yielded portions of the shield, legend and assayer's mark. The other coin was immersed in a hydrochloric acid solution to loosen and remove additional encrustation, allowing more of the surface of the coin to be exposed. Again, a portion of the shield and legend, and a complete

assayer's mark were revealed. The information gathered from these pieces was then compared against catalogues of known coins for identification.

After a thorough search to match the combination of shield type with the appropriate legends and assayers, both coins were found to exhibit characteristics unique to those designated the "Carlos and Juana Late Series" minted in Mexico City from 1542 to 1572 (Nesmith, 1977: 95; Pradeau, 1978:37; Grove, 1981:12). Both coins are roughly the diameter of one-*real* pieces, but no denomination marks were revealed and no weights can be recorded for them to confirm this value. One piece was struck under the supervision of assayer "L," and the other under assayer "O". Interestingly, despite the death of Juana in 1555 and the abdication of Carlos V in 1556, the legends on the coins of this series were not changed to reflect the ascent of Philip II. This was likely a nod of respect to the former rulers (Menzel, 2004:69).



Figure 13.4. The impression of coin 92-0841 in its concretion (L) and a drawing made of it in reverse (R).

Important information from coin 92-0841 came from a large piece of the encrustation, where a negative impression of part of a shield design was legible. Castings and drawings from the impression show portions of a rampant lion and a castle within a crowned shield surrounded by a beaded circle, a distinct "CA" from the legend, and an "L" to the immediate right of the shield (Fig. 13.4).



Figure 13.5. The surviving portion of silver coin 91-1183 (L) and a drawing of the same (R).

A second silver coin is in similar condition, but when its encrustation was removed, a portion of the actual coin and its markings was exposed. Again, drawings have helped to reveal the details of these designs. A portion of another shield containing lions and castles in quadrants is surrounded by a beaded circle and a legend. The letters “EGE” survive from the legend; an “O” is set just left of the shield (Fig. 13.5).

The “L” and the “O” on these two coins are the assayers’ marks, and these marks are key to determining the dates of the pieces. The assayer was the person who supervised the quality of the coins and ensured their fineness, and a 1592 law clarifies the purpose of the marks: “We order and mandate that each assayer puts on each piece a personal mark, by where it is known who made the assay of that coin: because if it is low-grade, we see which assayer to turn to” (Philip II, 1592: f338R). The identities and tenures of most Spanish colonial assayers are known, and in the case of these coins the L is the mark of assayer Luis Rodriguez, and the O is the mark of Bernardo de Oñate (Nesmith, 1977:95; Menzel, 2004:69,74).

When these two assayers worked is an important factor in dating the coins, and the historical record shows that Luis Rodriguez was working before Bernardo de Oñate. Rodriguez’ term began in 1548, and he worked into the late 1560’s, when prolonged ill health forced him to abandon his post. Oñate started at the mint around 1550 and worked his way up to become Rodriguez’ lieutenant before eventually succeeding him (Proctor, 2015:20). Oñate is known from an early archival document to have been striking coins at the Mexico mint as early as June 4, 1564 (Pellicer I Bru, 1997:285). But this document shows only that he was already working by that time, it does not provide a start date for his tenure. More recent research suggests Oñate’s work as assayer, or co-assayer, began as early as 1561 (Proctor, 2015:20). Rodriguez and Oñate also worked concurrently at times, as evidenced by coins with L struck over the O, and O over the L (Nesmith, 1977:22) (Fig. 13.6).

Archaeological evidence supports the historical accounts, and the excavations of three sixteenth-century Spanish Indies shipwrecks provide data affirming this sequence of employment for the two assayers. Of 766 Mexico late series coins still retaining their assayer's marks from the *Santa Maria de Yciar* shipwreck of 1554, 6% are assayer G; 3% are assayers A, R, & S combined, and 91% had the L mark, but none bore the mark of assayer O (Olds, 1976:112). On the wreck of the *San Esteban*, 84% of the coins were struck under assayer L; none were O (Arnold and Weddle, 1978:279). This suggests the latter had not yet begun to strike coins by April, 1554, when the ships of the 1554 fleet were loaded at Veracruz, Mexico for their last voyage (McDonald and Arnold, 1979: x). Another shipwreck, the Ines de Soto Reef site in

Cuba, reinforces this sequence. The ship, which was lost sometime after 1555, based on the recovery of an astrolabe bearing that date, also carried many late series Mexico coins, and 78% were of assayer L, and 15% were of assayer O, suggesting that assayer O was perhaps just starting to produce coins at the time of the unknown ship's sinking (Díaz Gámez, 1998:123). Looking only at the evidence from these two shipwreck events, the earliest possible date for when assayer O and assayer L coins could have conceivably existed together is late 1554 to 1555.



Figure 13.6. Late Series one-*real* coins minted at Mexico City under assayers L and O, shield sides (obverse) top, and pillars and waves (reverse) below. From left to right: L; L over O; and O. (Detail from Nesmith, 1977: plate VII).

Silver coins issued by Spanish colonial mints were supposed to contain 93% of the metal (Menzel, 2004:12). Elemental analysis of the St. Johns Mexico coins via X-ray fluorescence testing shows coin 92-1194 of assayer O is 87% silver, and coin 92-0841 of assayer L is 67% silver (Crandall, 2016). The largest part of the impurities is made up of copper, followed by tin, lead, and arsenic (Fig. 13.7). This relatively fine-grade silver of coin 92-1194 is in line with the purity demanded of official coinage. Coin 92-0841 might have been made of a lesser-grade of silver, but its differences in composition from its counterpart might also stem from the piece being much more corroded, with a smaller amount of silver remaining.

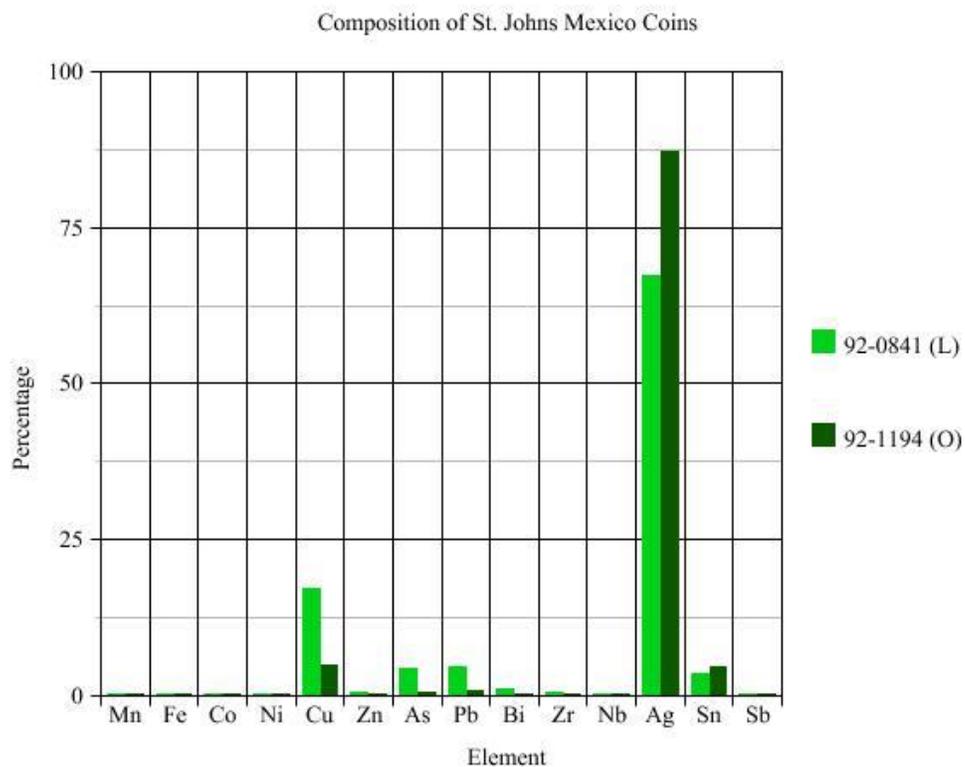


Figure 13.7. Elemental Composition of the St. Johns Mexican Silver Coins: Percentages of Manganese (Mn), Iron (Fe), Cobalt (Co), Nickel (Ni), Copper (Cu), Zinc (Zn), Arsenic (As), Lead (Pb), Bismuth (Bi), Zirconium (Zr), Niobium (Nb), Silver (Ag), Tin (Sn), and Antimony (Sb).

Plata Corriente



Figure 13.8. *Plata Corriente* from the St. Johns Wreck. L to R: 93-1357, 92-1281, 93-1383.

Three irregularly-shaped nuggets of silver from the wreck are all approximately the weight of small denomination coins (4.95g, 7.16g and 15.61g). Because of their thickness, these pieces survived the corrosive marine environment better than the coins, and they could be conserved and stabilized by electrolytic reduction treatment. The largest of these pieces is marked on one side with a portion of a circular stamp. A legend runs along the interior edge of this stamp, but a capital "D" is the only readily legible character, and any significance is unknown. The other two pieces bear no markings (Fig. 13.8).

These silver artefacts may be rooted in "tepozque" currency, a medium of exchange devised to substitute for the scarcity of government issued coinage in post-conquest Mexico (Pradeau, 1978:21-22). Gold, first made into disks, and later smaller slugs, was stamped with a weight mark and then used as money. Fraud quickly became rampant with *tepozque*, most commonly by mixing copper with the gold. Apparently the tradition of *tepozque* coinage continued into the reign of Philip II (1556-1598). Multiple references to *tepozque* are found in the homebound register of the *Santa Maria de Yciar* leaving Veracruz in 1554 (McDonald and Arnold, 1979: 107, 110).

Tepozque was gold-based, but the St. Johns pieces are silver and thus are more likely examples of another unofficial medium of exchange called *plata corriente*, or currency silver. *Plata corriente* consisted of small bars and bits of un-assayed silver and was used in the early colonial provinces of Peru (Menzel, 2004:163). In the time between when South American silver was first being extracted and the opening of the official mints in the late 1560's, *plata corriente* served as a way for the newfound wealth to be utilized and spent. For the first few years after the discovery of silver deposits at Potosí in 1545, all Peruvian silver was valued equally, but in the early to mid-1550's, there began to be a divergence in the values of *plata corriente* and the more-pure, assayed silver. Complicating the determination of *plata corriente's* value, was the practice of cutting the pieces of silver into ever smaller bits to make "change," which often removed stamps or markings and required that the pieces be weighed to determine their value (Szászdi, 1975:438-439).

Even with the establishment of a mint at Lima in 1568, *plata corriente* continued to be used as *de facto* currency in Peru, despite the fact that silver from that point was supposed to be refined into higher-quality coin silver (Grunthal & Sellschop, 1978:12-13). Testimony from a 1575 inquiry into the use of *plata corriente* in Peru shows that not only was it the result of inefficient smelting techniques, a version was also sometimes purposely made by adulterating higher quality silver. As one witness described, "he knows that the *plata corriente* to present... is debased and of less value because Indians who go to pay tribute to their masters, and also the miners, as they have seen that bad silver is worth the same as

good, they mix it with lead and copper and other metals” (Barrera, 1575, f.17v). It was still a problem in Quito as late as 1615, where the King ordered the officials there to stop the use of *plata corriente* “which is without assay and without a fixed or certain value” and to instead allow only assayed silver and gold for trade (Philip III, 1615).

When the Spanish first began to exploit Andean silver through easily accessible surface ores, it was done via Native Andean labourers utilizing their traditional smelters called *huayras* (Pease, 1992:242; Bakewell, 1977:61). Then, the revolutionary, new process of mercury amalgamation, whereby mercury was mixed with the silver ore to increase the effectiveness of metal recovery, was introduced in Mexico in 1556. By 1563, virtually all Mexican silver was recovered through the new technique, slowed only by the fact that supplies of the crucial liquid metal had to be imported from Spain (Bakewell, 1971:138, 151). In 1566, mercury deposits were found in the Andes at Huancavelica, and the mercury amalgamation technique began to first be used in Peru in 1572 (Craig, 1994:275; Tandeter, 2006: 323-324). With easy access to mercury, adoption of the technique in Peru was swift, and within the year nearly all silver miners in the Greater-Potosí region were using the new process (Bakewell, 1977:62). This development revolutionized the Spanish colonial silver industry by allowing nearly pure silver to be extracted from even low-quality ores, and with much greater efficiency.

X-ray fluorescence of the St. Johns pieces shows that all three have similar elemental fingerprints, with the largest part of their composition being silver, followed by significant portions of arsenic and lead, smaller amounts of bismuth, tin, and copper, and trace amounts of other elements (Crandall, 2016). This low-grade, unrefined silver is typical of *plata corriente*. Interestingly, the St. Johns pieces do not show any mercury. On its face, this would seem to imply that the silver had not been processed via amalgamation, but the same test on Andean coins from the 1622 galleon *Nuestra Señora de Atocha* that were certainly made of mercury-amalgamated silver also showed undetectable levels of mercury. Another study of the composition of Spanish colonial coins also found only very small traces of mercury, suggesting that the liquid metal was thoroughly driven off in the refining process (Guerra, 2004). But the same study showed that the presence of another element, antimony, was correlated with Peruvian silver and pre-amalgamation Mexican silver; a confirmation perhaps of the colonial observation that ores containing antimony were resistant to mercury amalgamation (Bakewell, 1971:130). All of the St. Johns silver, both coins and nuggets, show the presence of antimony in relatively high numbers ranging between 760 and 1270 parts per million.

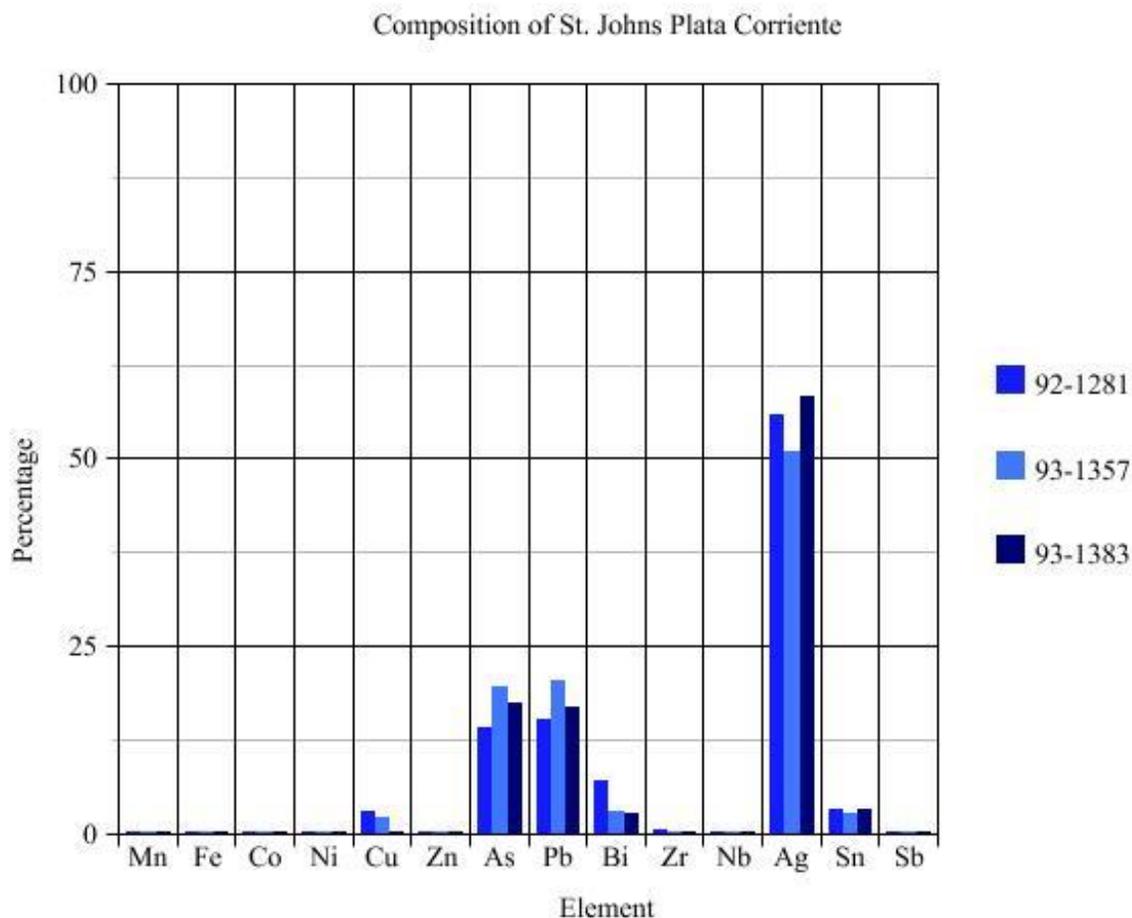


Figure 13.9. Elemental Composition of the St. Johns *Plata Corriente*: Percentages of Manganese (Mn), Iron (Fe), Cobalt (Co), Nickel (Ni), Copper (Cu), Zinc (Zn), Arsenic (As), Lead (Pb), Bismuth (Bi), Zirconium (Zr), Niobium (Nb), Silver (Ag), Tin (Sn), and Antimony (Sb).

Plata corriente is historically a South American phenomenon, but the X-ray fluorescence analysis of a coin recovered from the *Atocha* provides evidence that links the St. Johns examples more specifically to Potosí. The *Atocha* coin is an eight *reales* piece struck at the Potosí mint under an unknown assayer (the mark was corroded away) during the reign of Philip III (1598-1621). Surprisingly, the coin was made of only 63.5% silver. This percentage of silver is in line with that found in *plata corriente*, but more importantly, the types and percentages of its impurities match almost exactly the pattern of those from the St. Johns pieces (Fig. 13.10). The *Atocha* coin was made at Potosí of low-grade, poorly-refined silver, perhaps as a form of fraud on the part of some unknown party, but its importance here is that its matching elemental “fingerprint” helps to tie the St. Johns *plata corriente* to the same source of silver.

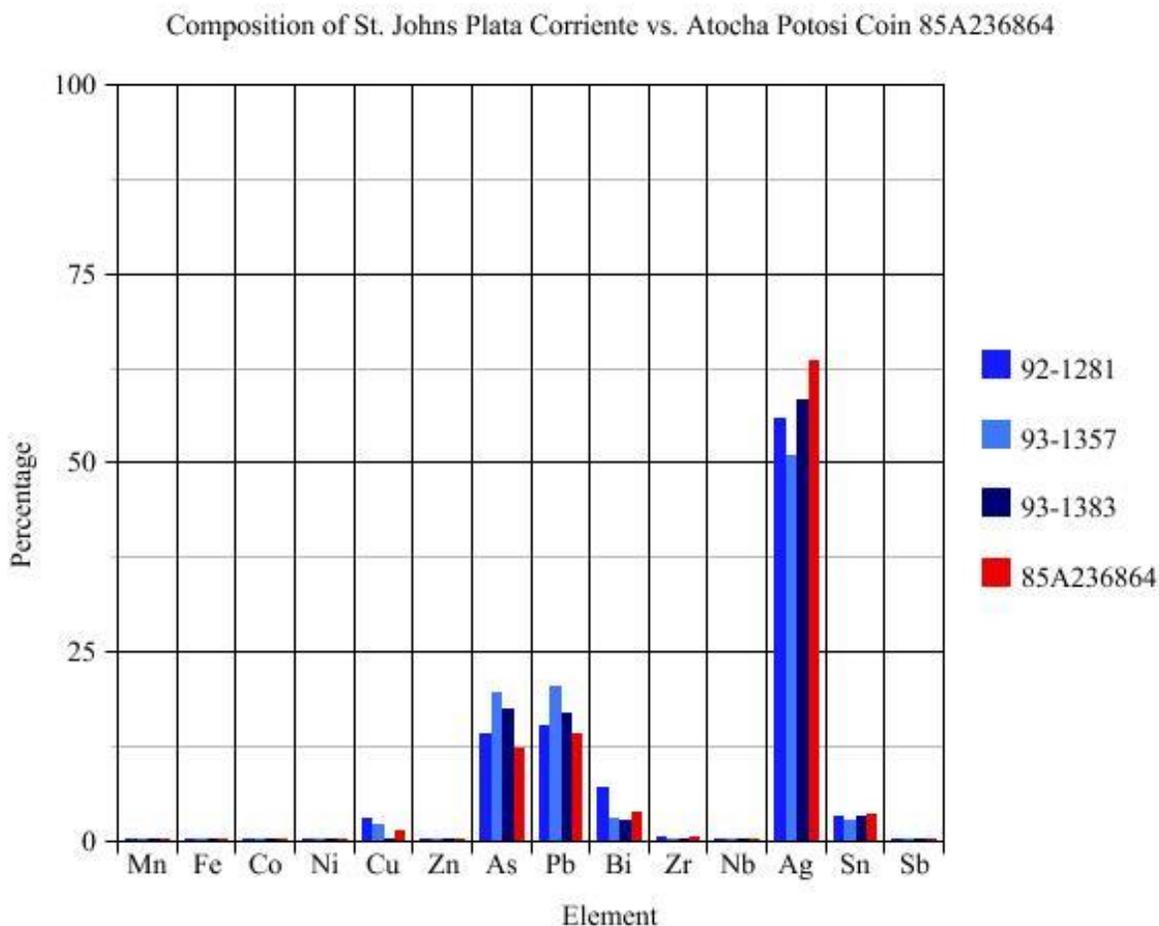


Figure 13.10. Elemental Composition of the St. Johns *Plata Corriente* and a fraudulent *Atocha Potosí* silver coin: Percentages of Manganese (Mn), Iron (Fe), Cobalt (Co), Nickel (Ni), Copper (Cu), Zinc (Zn), Arsenic (As), Lead (Pb), Bismuth (Bi), Zirconium (Zr), Niobium (Nb), Silver (Ag), Tin (Sn), and Antimony (Sb).

Plata corriente is not well-represented in the archaeological record, but at least three similar, irregularly-shaped, silver “coins” with crude stamps on one side have been found at the Spanish settlement of Santa Elena in South Carolina, occupied from 1566 to 1587 (South, Skowronek, & Johnson, 1988; 166-167).

The coins and silver of the St. Johns wreck span a wide range of geographical sources and time. At least one copper coin comes from Seville and was already quite old before the wreck occurred. Other, silver coins were minted at Mexico City, and the combination of assayers’ marks found on them could not have occurred until sometime between late 1554 according to existing archaeological data, and 1561 according to historical evidence. The presence of antimony in the Mexican coins suggests they were made without the benefit of mercury amalgamation, almost certainly before 1563. Three pieces of low-

grade, amorphous silver bits are *plata corriente*, a type of informal currency used in Spanish colonial Peru primarily before the establishment of mints in the area in the late 1560's, but which was used illegally into the later part of the century. Analysis of the metal composition links the St. Johns *plata corriente* to the Andean mine at Potosí, discovered in 1545. Taken together, the historical, metallurgical, and archaeological evidence for both the coins and *plata corriente* of the St. Johns wreck provide the shipwreck with a likely *terminus post quem* sometime in the period of 1556-1562, with an absolute bottom date of late 1554.

Why this small collection of "treasure" was on board the St. Johns ship is not clear. Perhaps it was only "pocket change;" money carried by crew and passengers. The pieces of *plata corriente* were all found in close proximity near the central waist of the ship, suggesting some sort of relationship. The coins, though, were in no particular concentration, and it is easy to imagine they had been dropped and lost in cracks and crevices over the lifespan of the ship.

CHAPTER 14: FAUNA AND FLORA

A small collection of bones, seeds, and insects from the St. Johns site provides significant information about the food and non-human creatures traveling on the ship, as well as the regions to which it most likely travelled.

Teeth



Figure 14.1. Tusk 92-0955 and molar 92-0754, two views of each. Both are from a domestic pig (*Sus scrofa*).

Two teeth found during the 1992 season have been identified as a molar fragment and an upper left incisor from an adult domestic pig (*Sus scrofa*) (Wing, 1993). These teeth were found in fairly close proximity at just over one meter apart, and it appears likely they came from the same animal (Fig. 14.1).



Figure 14.2. Triggerfish Tooth 92-1254.

Five teeth, all of the same type - pointed, darkened, and on long, straight roots - were found across the site (Fig. 14.2). These teeth were in good context and found in undisturbed areas of the shipwreck. Identification revealed that they are the teeth of the Queen Triggerfish (*Balistes vetula*) (Wing, 1993). The Triggerfish is a common inhabitant of the waters of the Little Bahama Bank, and they were frequently observed on the site throughout the course of the excavation. The teeth are most likely the remains of fish that died naturally at the site.

Bones



Figure 14.3. Innominate bone fragment 92-0755 from a cow (*Bos taurus*).

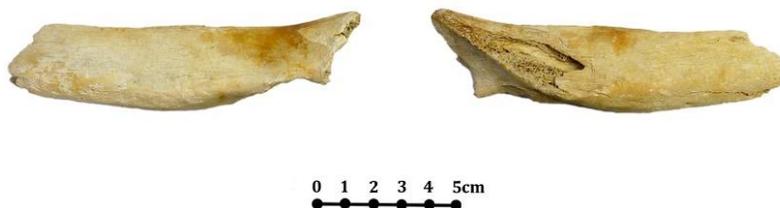


Figure 14.4. Spinous process fragment 99-2739 from a cow (*Bos taurus*) vertebra.



Figure 14.5. Cow (*Bos taurus*) scapula 99-2657 with butchering mark from a knife or cleaver.

One bone from the 1993 excavation is a fragment of an innominate bone from a domestic cow (*Bos taurus*) (Fig. 14.3) (Scudder, 1994). Two other specimens from the wreck also appear to be from cows – one a possible spinous process from a thoracic vertebra (Fig. 14.4), and the other a scapula, which bears a clear knife or cleaver mark from the butchering process (Fig. 14.5) (Faraldo, 2016).



Figure 14.6. Unidentified mammal bone fragments.

A number of other mammal bone fragments were also recovered (Fig. 14.6), and though one is clearly a small piece of a rib (too small to be from a cow) they cannot be identified further.

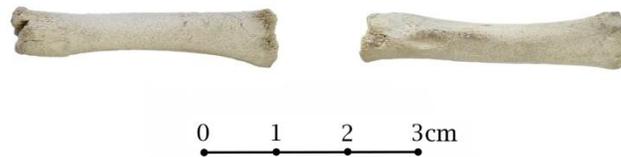


Figure 14.7. Femur of a juvenile crocodylian 93-1371, likely *Caiman* sp.

One small bone was suspected to be a chicken bone when excavated, but formal analysis at the University Of Florida Museum Of Natural History revealed a surprising identification – it is the femur shaft from a very young crocodylian (Fig. 14.7). When compared against examples from an alligator, a crocodile, and a caiman, it matched most closely with the caiman (Scudder, 1994). The ends of this bone are unfused, meaning it was a very young animal; bigger than a hatchling but less than one year old.

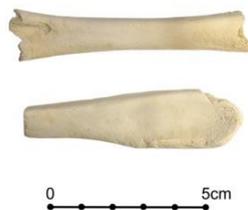


Figure 14.8. Modern Bones 95-1794a/b.

Two light bones were recovered from the sand above the shipwreck. One was sawn, and both appear to be modern chicken bones (Fig. 14.8). It is suspected that they were dropped on the site by one of the modern salvage groups.

Seeds

A small number of nut and seed remains have been recovered from various environments of the St. Johns Wreck. All of these specimens are the hard, tough portions that were able to survive the challenging underwater environment.



Figure 14.9. Hazelnut 96-2153, three views

A portion of a hazelnut shell (*Corylus avellana*) was buried deep in the silty sand near the bedrock at the site (Fig. 14.9). The broken shell looks to have been from a nut that had been opened sometime before the ship sank. Another, smaller nutshell fragment recovered from a barrel hoop concretion is the same thickness, and has the same general curvature of a hazelnut, but it is too incomplete to identify with any certainty.



Figure 14.10. Grape seed 95-1810a (*Vitis vinifera*), two views.

A single grape seed was found buried in the concretion surrounding a barrel hoop fragment (Fig. 14.10). It was found in association with the small, suspected hazelnut shell fragment described above.



Figure 14.11. Two views of olive (*Olea europaea*) seed 95-1869 (L) with a modern example from the US Department of Agriculture (R).

Half of an olive seed came from deep in the sand at the eastern edge of the St. Johns site. It is broken into two pieces (Fig. 14.11).

Insects



Figure 14.12. Two beetle elytra, 95-1863 & 95-1867.

Two elytra, the tough shells that cover insect wings, were found buried deep in the silty sand of unit F6U, very near the olive seed. These small pieces – one is 6 millimetres long; the other 8 millimetres – are identified as coming from beetles, possibly of the superfamily *Tenebrionoidea* or the family *Carabidae* (Fig. 14.12) (Skelley, 2016).



Figure 14.13. Cockroach ootheca 95-1810b recovered from barrel hoop concretion.

Another two insect fragments came from the calcareous concretion of the same iron barrel hoop where the grape seed and small nutshell fragment were found. One is quite clearly a fragment of a cockroach ootheca, or egg-casing (Buss, 2016). This piece shows five egg-chambers on the interior face, a matching number of ridges on the exterior, and it has a serrated edge (Fig. 14.13). Its form, and that of its egg chambers, is most in line with descriptions of oothecae of the American cockroach (*Periplaneta americana*) (Cameron, 1961:25; Koehler, Bayer & Branscome, 2013:2).

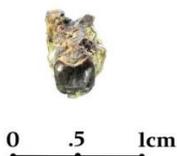


Figure 14.14. Unidentified insect pronotum 95-1810c from barrel hoop concretion.

The other insect fragment found in the same barrel hoop concretion appears to be a pronotum (the section immediately below the head), and likely from a beetle, but it cannot be further identified.

Food on *Carrera de Indias* Ships

Almost all of these items appear to relate to food on board the ship, though not all represent the standard fare. Shipboard diet in the sixteenth-century Spanish Indies system is fairly well recorded, and it looks to have varied little. A typical example is found in the rations for a fleet sailing to the Americas in 1568, which were outlined as follows (Pérez-Mallaína, 1998:141):

- Mondays, Wednesdays, Fridays and Saturdays: 1 ½ pounds of biscuit, 1 litre of water, 1 litre of wine, ½ peck of mixed horse beans and chickpeas for each 12 persons, 1 pound salted fish for each 3 persons.
- Tuesdays: 1 ½ pound of biscuit, one litre of water, 1 litre of wine, 1 pound of mixed rice and oil for each 10 persons, and ½ pound of salt pork.
- Sundays and Thursdays: 1 ½ pound biscuit, 1 litre of water, 1 litre of wine, 1 pound salted meat, 2 ounces of cheese.
- Each month: 1 litre of oil and a little more than ½ litre of vinegar per person.

Similarly, in 1587, García de Palacio recommended that ship's crews be fed breakfasts of biscuit, garlic, sardines or cheese, and wine; for the other meals, meat was to be served Sundays and Thursdays; fish and beans on the other days, and all supplemented by biscuit (García, 1587:319).

The rather routine, standard fare outlined in the official menus was often augmented with other, more healthful and tasty foods, and one reason for these supplements was to help take care of the sick. It is known that in the early seventeenth century, foods such as sugar, white flour, eggs, raisins, nuts, and fresh meats were carried on board Indies ships as *dietas*, or special curative foods for the sick (Philips, 1986:178). But such foods were not always limited to the sick, as roasted chicken, white biscuit, dried fruits, and fine wine were also standards of the ship-master's table (Pérez-Mallaína, 1998:142-143). García de Palacio, despite having outlined his take on the standard diet for Indies ships, also strongly recommended that ship-owners go above and beyond the bare minimum and to feed their crews liberally: "And so for he who owns the ship, there is reason to gather more provisions than is usually necessary for the voyage he wants to make, but desiring to measure things with rigor, it is advisable that the ration for each person of his ship be one and two-thirds pounds of bread, and one and one-half pints of wine, and one quart of water for each a day; and between thirty men three bushels of chick peas or beans, meat, fish, olive oil, vinegar, and other trifles; the more and better, the more he saves, since treating the people well always brings advantage, and goodness, and contentment, and they will serve any need with better advice, care, and work" (García, 1587:305).

Examples of foodstuffs have been found on other Indies shipwrecks. The 1554 *San Esteban* site at Padre Island, Texas yielded pig bones, an olive pit, and a hazelnut shell (Arnold and Weddle, 1978:264-265). In Florida, on the Emanuel Point I shipwreck of 1559, a site with particularly good organic preservation, there were bones from cows, pigs, chickens, and sheep or goat (Smith, et al, 1995:75-77). Some bones had butcher marks and others were burned, apparently from cooking. There were also many seed and nut remains, including hundreds of olive pits, 12 persimmon seeds, cherry seeds, plum, sapote, papaya, hazelnut, hickory, acorn, and coconut, showing a diet that went well beyond the recommended *Carrera de Indias* menus (ibid:92).

Foodstuffs were also carried as commercial goods or supplies for the colonies. The cargo lists of the 1557 Honduras-bound ship *Los Tres Reyes Magos*, show that it carried many dozens of jars of olives, hazelnuts, and almonds in its shipment of goods for the Indies colony (Casa de Contratación, 1557; see Table 11.1). Jars and barrels of hazelnuts, raisins, olives, almonds, rice and other foods were brought to supplement the Florida colony of St. Augustine in the years 1568-1571 (Lyon, 1992:38-43).

The evidence for foodstuffs from the St. Johns wreck compares favourably to the archaeological and historical record, if only on a somewhat smaller scale. Cow bones from the St. Johns wreck could represent the remains of livestock consumed at sea, but it would seem unlikely, based on the cut marks and the fact that it would have been unhygienic to retain spent bones. Instead, these beef remains probably signify salted provisions; something that would have been served on the ship's "meat days." The pig's teeth are much more likely to have come from a live animal, as animal heads with jaws and teeth are not typically salted. Pigs, long a part of the traditional Spanish diet, were first carried to the New World in 1493 with Columbus' second voyage, and by the end of the sixteenth century they were found throughout much of South, Central, and south-eastern North America (Long, 2003:371). Pigs, horses, cattle, and sheep were purposefully introduced to the colonies, but the pig was the most adaptable and thrived with virtually no maintenance, which allowed them to flourish (Super, 1988:29). On some Indies islands, pigs were "seeded" by the Spanish so they and their offspring could be harvested as needed by passing ships at a later time (Zadik, 2005:39). Live pigs, as well as chickens, were commonly carried by passengers on Indies ships as a way of having fresh meat available during the long ocean crossings (Pérez-Mallaína, 1998:132). It is likely the St. Johns pig was livestock on the ship and meant to be slaughtered at sea during the voyage.

The St. Johns nut and seed remains are all types that are characteristically Spanish, and the grape and olive, along with wheat, form the "Mediterranean trilogy" of staples – wine, olives/olive oil, and bread –

that has been relied upon for millennia throughout much of southern Europe (Medina, 2005: 46-48). The hazelnut, though not as key to the Spanish diet as the grape or olive, has been a consistently-used food there since Roman times (ibid: 51). The grape was typically used in Spain for wine production, but it was also dried for raisins. The climate across of much of the New World was not always hospitable to viticulture, or olive growing, but, despite this these fruits did eventually find their niches, and became American agricultural products. By the mid sixteenth-century, despite royal discouragement against competition with Spanish wine merchants, grapes were being successfully grown in areas of colonial Peru (Davis, 1984:91). It is possible that the St Johns grape seed might represent seed stock being carried to the New World to help create American vineyards, but a more-likely reason for its presence is that it was from a supply of raisins being carried as *dietas* for the sick, or the personal treats of those who could afford them.

The archaeological remains of insects on other early, Spanish Indies shipwrecks are also known. Two species of cockroach were found on the 1554 *San Esteban* shipwreck – *B. orientalis* and *P. Americana* (Durdan, 1978:416). These two species rarely coexist, and it is thought that each represent separate infestations, one in Europe and one in the Americas. Cockroach wings, a pronotum, and an ootheca from the *P. Americana* cockroach were recovered from the Emanuel Point I site of 1559. This evidence of roaches on the ship was accompanied by the discovery of the elytra of *Dermestes* species beetles, most likely *Dermestes maculatus*, or the hide beetle (Smith, et al, 1995:85). The insect remains were associated with olive pits and other organic debris on the site. An elytron from the beetle *Bruchus rufimanus*, a stored food pest, was identified from the wreck of the 1622 galleon *Atocha* (Malcom, 1993:6). Interestingly, the American cockroach is native to Africa and is thought to have arrived in the Americas in the seventeenth century (Frank & Thomas, 2013:4; Guiaşu, 2016:23). This preponderance of archaeological evidence from shipwrecks pushes that date back further, well into the 1500's.

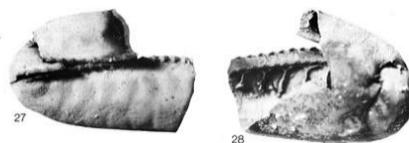


Figure 14.15. Cockroach (*Periplaneta americana*) ootheca from the 1554 *San Esteban* shipwreck (Durdan, 1978:415).

The historic record also makes it clear that insects and other vermin were common on ships of the sixteenth-century. One of the earliest accounts comes from Columbus' fourth voyage, when, eight

months into it, his son Ferdinand Columbus wrote, "... and with the heat and the humidity of the Sea, the biscuit had filled with worms; and likewise, God help me, I saw many who were waiting for dark to eat it. Some were not removing the worms, although they saw them, because if they were getting rid of them, they would lose the dinner" (Colon, 1571 [1749]:108). Another Spanish traveller to the Indies humorously wrote of the many cockroaches and rats as something to be hunted for sport: "For game in the neighbourhood [i.e. on board the ship], there are fine flights of cockroaches – they call them *curainas* here – and very good rat hunting, the rats so fierce that when they are cornered they turn on the hunters like wild boars" (Salazar, 1573 [1984]:433). Some 300 years later, the situation had changed little. A Dr. Gonzalez wrote of shipboard food: "We have seen more than once a sailor use, without any consequences, biscuit that had all the insinuated defects; so that the worms and filth that were contained in it were prepared and swimming in the soups" (Gonzalez, 1805:16). All the evidence, historical and archaeological, makes it clear that insects were a simple fact of life on these ships.

There are a few descriptions of Spanish colonial interaction with caimans, but a 1510 account by Martín Fernández de Enciso tells of an encounter with one in southern Panama. According to his story the caiman was as big as a bull and so tough it could not be speared with ten lances. Eventually, though, it was killed, then cooked and eaten (Gerbi, 1985:86). Despite the fact that Fernandez and his men ate theirs, there is nothing else to indicate the caiman was ever a regular part of the Spanish colonial diet. The very small size of the St. Johns example further suggests that it was not on board to be consumed, but, rather, it was being transported as a pet or zoological curiosity.



Figure 14.16. Caiamant [Caiman]. (Anonymous, ca. 1590, *Histoire Naturelle des Indes*, f.53, Pierpont Morgan Library, New York).

The range of crocodylians in the New World covers much of the same area as Spanish-America, from Southern Florida to the Greater Antilles and Central Mexico to the Amazon basin. The range of caimans, though, is smaller and limited to the sub-1000 foot elevations ranging from the extreme south of Mexico

through northern South America, and into Brazil (Lever, 2003:30; Velasco & Ayarzagüena, 2010: 10). Herein lays the importance of the caiman bone for this study: it is undoubtedly from the “Tierra Firme” region of The Americas (Fig. 14.17). Based on this geographic range, the ship had to almost certainly make landfall somewhere between Lower Central America to Northern South America to acquire the caiman.

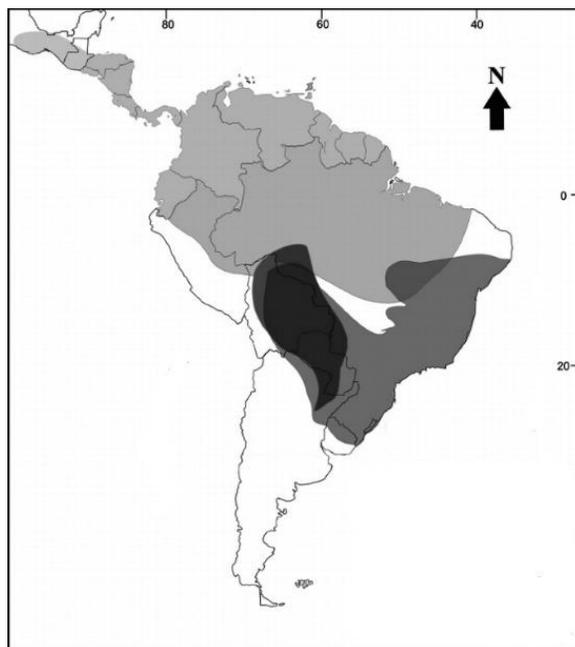


Figure 14.17. Geographic distribution of Caiman genus; *Caiman crocodilus* (light grey), *C. latirostris* (med. grey), and *C. yacare* (dark grey). (Image adapted from Bona, et al, 2014: figure 5.)

The small but diverse collection of organic remains from the St. Johns shipwreck give good understanding of the foods consumed on board, the nature of shipboard living, and trade and other interactions between the ship and the Americas. Salted beef, freshly butchered pork, olives, raisins, and hazelnuts were available in some quantity to those traveling on the ship, though some of this food might also have been intended for people in the colonies. The ship was, at a minimum, infested with small beetles and cockroaches. For some unknown reason, but probably because it was a New World curiosity, a small, juvenile crocodilian of the Genus Caiman was being carried from the *Tierra Firme* region before it was buried on the Little Bahama Bank. All of these things are concrete evidence that ships in the *Carrera de Indias* transported much more than just people and their possessions; they also carried plants and animals, purposefully or not, and delivered them to places they had never previously been.

CHAPTER 15: MISCELLANEOUS OBJECTS

Many artifacts recovered from the St. Johns wreck defy easy categorization. Many are single pieces that, on their own, do not constitute a type-category within the collection. Taken together, though, these pieces offer a broader view of the activities and lifestyles on the St. Johns ship. This assortment of artifacts reflects many aspects of shipboard living, including cooking, medical treatment, trade, and navigation, among others.

Food Preparation



Figure 15.1. Three copper cauldron panels.

Three curved, trapezoid-shaped copper panels, each approximately 110 centimeters tall, are pierced with rivet holes along one edge (Fig. 15.1). A number of loose copper rivets have also been found on the wreck, and they look to have once held the panels together (Fig. 15.2). These pieces match descriptions of riveted copper cauldrons from the early colonial period, and historical and archaeological evidence shows that such cauldrons were carried on some of the earliest Spanish ships traveling to the Indies. In 1505, the caravels *Santiago*, *San Juan*, and *Santa Cruz*, sailing to Hispaniola, each carried a fifteen-pound copper cauldron for cooking meals (Ladero Quesada, 2006:307). García de Palacio suggested that ships carry three cauldrons - one for caulking-pitch or tar, and two for cooking on the *fogón* (1587 [1993]: 308). Other research indicates that Spanish ships of the later sixteenth and early seventeenth centuries utilized large copper cauldrons, typically of 40-45 pounds, to prepare food in brick and sand-lined fireboxes called *fogónes* (Philips, 1986:103; Spalding, 2015:39). As a concrete example of this, four copper cauldrons were recovered from the Emanuel Point I shipwreck; these vessels were of varying design, but one was made of riveted side panels similar in size to the St. Johns examples, which attached

to a rounded-dome bottom (Moore, 1998: 88-97). A fragment of a tapering, cylindrical copper cauldron of unknown size was recovered from the ca. 1565 Basque 29M shipwreck at Red Bay, Newfoundland (Dunning, 2007:241). Copper cauldrons made of riveted panels were also used for processing ore in the Spanish colonial silver industry (Barba, 1630:130; Fig. 15.3), though, considering the shipboard context, the St. Johns pieces are almost certainly from a cooking cauldron.



Figure 15.2. A typical copper rivet from the St. Johns Wreck.

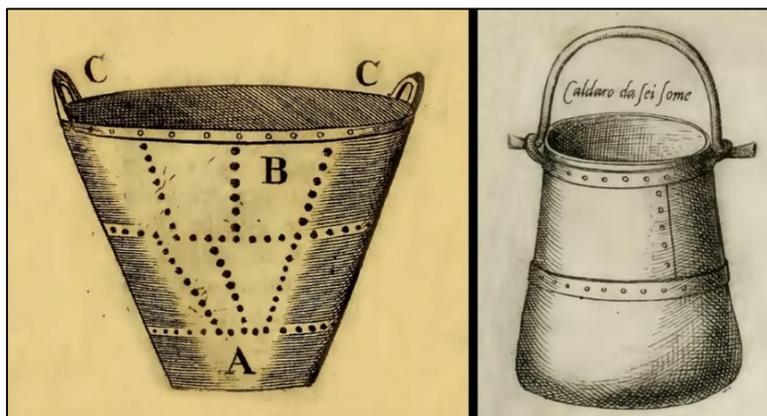


Figure 15.3. Two cauldrons: (L) Riveted copper cauldron for use in processing silver ore. The original, keyed descriptions translate as “A. Bottom of one piece. B. Cauldron of pieces. C. Handles.” (Detail from Barba, 1640: 130). (R) A cooking cauldron of six *somos*, or ca. 120 gallons, (from Bartolomeo Scappi, 1570: f.7).



Figure 15.4. Wood Charcoal

Many pieces of wood charcoal have been found on the wreck site (Fig. 15.4). Some of these pieces are sizeable, larger than 7.0 centimeters across, and it is presumed that they are partially burned wood cooking fuel from the ship's firebox or *fogón*.



Figure 15.5. Resin Cast of a Pierced Iron Plate, front and back views.

A ca. 7.0 x 9.0 centimeter section of what was once flat iron, now cast of resin from its concretion, is pierced with regularly-spaced holes that appear to have been made with a square-shanked nail (Fig. 15.5). The piece does have a portion of its original edge, which is curved and suggests the complete form was round. This shape is supported by the curving rows of holes. The section has a clear front and back, as the piercings were all made from the same direction, with the “back” side having the metal from the holes pushed outward, creating a rough surface. The piece is unidentified, but there were a variety of kitchen implements – colanders, strainers, and graters – made of similarly-pierced metal (Fig. 15.6), and it seems most likely that this fragment comes from some similar item.

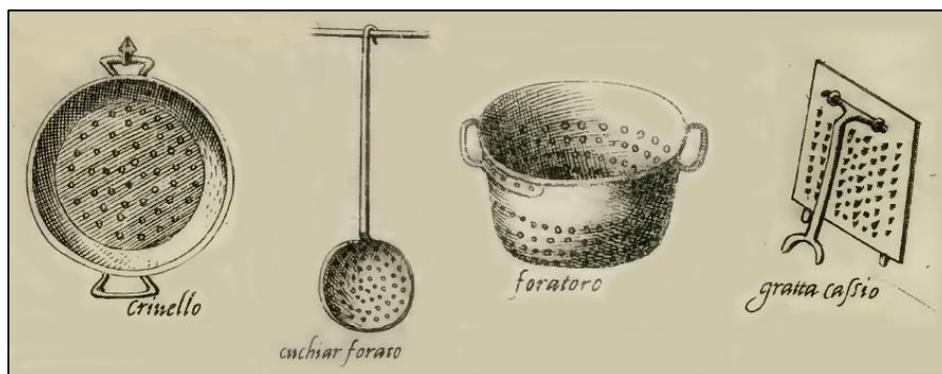


Figure 15.6. Various kitchen implements made of pierced metal, including colanders, strainer, and grater. (From Scappi, 1570, f.9 &10).

Fish Spear

A nearly complete iron fish spear was cast from the concretion that formed around the decomposed original. The device is 39.0 centimeters long, from the base to the tip of the central prong (Fig. 15.7). The tapered base would have fit onto a shaft 4.2 centimeters in diameter. The central prong is one with the base, and the other prongs were forge-welded onto it separately. The spear originally had five prongs (one of them is missing and has not been found), making it a “pentadent.” The St. Johns fish spear, mounted on a long wooden shaft, would have been used to jab at fish, or perhaps hurled at them. The points of each prong are barbed as a way of preventing any fish that might be caught from wriggling free. The ability to catch fish allowed the people on board the ship to have fresh seafood during the long voyage and relief from the salted meats that were standard shipboard fare. This fish spear would also have served as an effective pole-arm, if needed.



Figure 15.7. Iron Fish Spear, before and after conservation.

Barbed, multi-pronged, metal fish spears are ancient devices, and they first appeared in Europe and the Mediterranean around the eleventh century BC (Sahrhage & Lundbeck, 1992:12). The famed trident of the Greek god Neptune is actually based on the ancient Mediterranean tuna spear, though its three-pronged design was not as effective as more modern versions of the “fish iron,” which generally employ

five, seven, or even more prongs (Gabriel, Lange, Dahm & Wendt, 2005:55). A barbed prong from a fish spear was found at the late fifteenth century settlement at La Isabela, likely sent there from Spain in 1494 (Deagan & Cruxent, 2002:148-149). A similarly-sized, five-pronged iron spear was recovered from the wreck of the 1622 galleon *Santa Margarita* and is in the collection of the Mel Fisher Maritime Museum in Key West, Florida.

Barrel Hoops



Figure 15.8. Barrel Hoop Fragments 95-1810.

Many hundreds of iron barrel hoop fragments were recovered from the shipwreck. Most were completely corroded and had been broken into small sections over the centuries underwater. There were no complete examples uncovered, though one piece, representing roughly 60% of a hoop, was 83 centimeters in diameter (see Fig. 2.13). The vast majority of these iron bands remain to be conserved, but those that have been show that they are 4.5 centimeters wide, on average, and 0.4 centimeters thick (Fig. 15.8). They were joined with iron rivets at their overlap. There is no evidence of wooden staves found on the site.

Many similarly-styled iron hoop fragments were recovered from the 1554 *San Esteban*; one intact example, likely for a keg, measured 22.5 centimeters in diameter (Arnold and Weddle, 1978:261). The 24M vessel at Red Bay, Newfoundland, had many large wooden casks that were designed to hold whale oil, and they had wooden hoops made of Alder and Willow (Lowen, 2007b: 13). An iron barrel hoop approximately 50 centimeters in diameter was found on the Emanuel Point I site (Smith, Bratten, Cozzi, and Plaskett (1998:29, Fig.5). The Molasses Reef and Highborne Cay sites had no evidence of hoops or

staved containers. García Palacio offers some sixteenth-century insight into the purpose of these containers by recommending a ship carry four casks of pitch or tar and twenty barrels for holding and carrying water (García Palacio, 1587[1993]:307-308).

A 15-centimeter-tall, flat hook is a special type called a can-hook used for lifting barrels in and out of the ship (Fig. 15.9). One definition says it is: “an instrument used to sling a cask by the end of the staves: it is formed by fixing a broad and flat hook at each end of a short rope; and the tackle by which the cask so slung may be hoisted or lowered, is hooked to the middle of the rope” (Encyclopedia Britannica, 1823:107). As early as 1703, it was written that those in charge of victualling a ship needed to know “The Doctrine of the Can- Hook, and how much they affect the Heads and Crows of their Cask in their Hoisting In and Out” (Tutchin, 1703:16).



Figure 15.9. St. Johns can hook, three views (L), and a print of a can hook sling (R) (Biddlecombe 1848:39, Plate 5, Fig.6).

Lead Roll



Figure 15.10. Roll of Sheet Lead

A roll of lead sheeting is 41.9 centimeters long (wide) and 11.6 centimeters across the slightly flattened profile. The lead sheet is approximately 0.8 millimeters thick. This lead sheet likely was kept as part of the ship’s stores, available for any repair needs during the voyage, especially to patch leaks in the hull. García de Palacio made note of the use of sheet lead by recommending that if a ship’s hull is breached in battle, the crew should “find [the hole] and cover it and seal it, [by] taking a sheet of lead lined with

linen, and if there is no lead, of leather, and if no [leather] with eight or ten well-greased linens, [then the ship] will be able to sail or fight again if suitable” (García de Palacio, 1587 [1993]:339). A nearly identical roll of lead was found on the 1588 Spanish Armada wreck of *La Trinidad Valencera* (Flanagan, 1988:53), and 44 x 46 centimeter lead sheets were recovered from the 1622 galleon *Atocha*.

Iron Bar

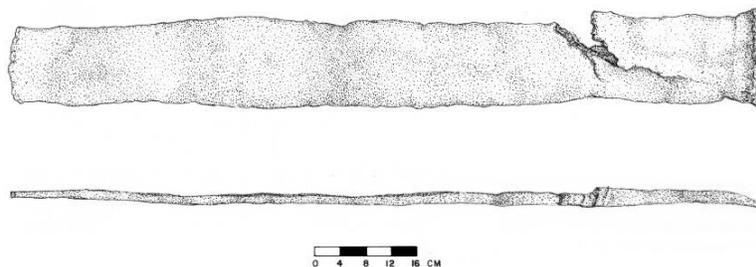


Figure 15.11. St. Johns Iron Plank 96-2095. (Drawing Robert Cummings/MFMHS).

A flat bar of iron came from the lower bow of the ship (Fig. 15.11). The bar, measuring 118 centimeters long, 12.7 centimeters wide, and 3.2 centimeters thick, is split and cracked, but this flaw looks to have been a part of its manufacturing process, not a result of the shipwreck. It also curves and thins at one end and looks to have been broken off from another piece. A nearly identical iron bar – flat and long, with a bent end – was discovered in excavations from sixteenth-century contexts in Paraguay, and it was thought to be a type of early-colonial “hatchet” money brought by the Spanish for trade with Native peoples (Pusineri Scala, 2016). Both pieces, though, are too large and are not properly shaped to be hatchets, and it appears that they are more likely stock iron bars. To reinforce this idea, two types of long, folded iron bars have been recovered from the late sixteenth-century Gresham wreck found on the Thames estuary (Auer & Firth, 2007; Birch, 2010). Though the Gresham examples are somewhat narrower than the St. Johns iron bar, their folds create a shape that is strikingly similar to its curved end (Fig. 15.12).



Figure 15.12. Folded iron bar from the Gresham Shipwreck (scale = 1 meter). (Photo: Thomas Birch, 2010).

The source for the Gresham bars is not known, but they are thought to most likely have come from England or Germany. Northern Spain was a leading exporter of iron in the fifteenth and sixteenth centuries, and the sole source of iron for the Americas for the first century of the colonial era (King, 2005:16-17; Parry, 1966:244). The St. Johns iron bar was almost certainly part of a larger, folded bar that was put on the ship in Spain, most likely for sale in the New World, but possibly for some for use on the ship. Apart from the Paraguayan bar, there is other evidence that iron bar stock was a part of the early Colonial-Indies material culture. Much smaller, flat stock-iron bars were recovered from the early sixteenth-century Molasses Reef Wreck (Keith, 1987:271-273). In 1565, Pedro Menéndez carried 600 *arrobas* of iron stock (15,000 pounds) and 38 *arrobas* of steel (950 pounds) from Spain to supply the new Florida colony (Lyon, 1992:34-35).

Horseshoes

Two horseshoes, both originally iron but cast from concretion, were recovered from the shipwreck. The larger is 15.4 centimeters by 12.5 centimeters; the smaller is 10.9 by 7.8 centimeters (Fig. 15.13). The larger is pierced with eight square holes, four along each side; the smaller has three holes per side, all countersunk for nail heads. The smaller shoe was possibly for a burro, though there is no way to determine this with certainty. Neither of these shoes had nails and there is no other evidence of horses or burros from the wreck, which suggests they were most likely part of a cargo.



Figure 15.13. Horseshoes 95-1829 (L) and 97-2355 (R).

The St. Johns shoes are similar to other early colonial-era examples. Iron horseshoes, each ca. 11 centimetres long, relatively straight-sided, and pierced with six or eight nail holes, were uncovered at the late fifteenth century settlement of La Isabela (Deagan & Crucent, 2002:240). A 23-centimeter long iron horseshoe was uncovered in excavations at Pachacamac, Peru and is thought to be a relic of Pizarro's 1530's conquest of that region (Eeckhout, 2016). Though it is larger, this conquest-era

horseshoe is similar in shape to the St. Johns examples, and it also has eight nail holes. The relatively wide and flat design of the St. Johns shoes also matches closely with an early seventeenth-century horseshoe from London (Noël Hume, 1991:238).

Cloth Seals



Figure 15.14. Lead Cloth Seals

Two lead discs embossed with designs have broken, strip-like appendages extending from their sides and protrusions on their back sides, which are features that match with the design of two-disc cloth seals. Such seals had two flat discs joined by a connecting strip; one disc had a hole in the center, the other a protruding rivet. To seal them, the discs were folded together, and the rivet passed through both the cloth and the hole of the other disc; they were then squeezed together and the faces impressed with marks (Egan, 1987:13). Lead cloth seals, which were attached to lengths of cloth to denote quality, size, taxes paid, or simply a maker's logo, offer some of the earliest evidence for the importation of cloth from Europe to the American colonies (Staples & Shaw, 2013: 135). In the sixteenth century, Spanish wool, linen, and silk were imported to the American colonies by *Carrera de Indias* ships, though by the later part of the century, cloth supplies were coming from other European countries, and even China (Parry, 1966:238-239). Perhaps typical of a Spanish Indies vessel, the ship *Los Tres Reyes* carried many types of cloth in bulk, including *olanda* [Dutch linen], *cañamaza* [burlap], *lino* [linen], *carisea* [jersey], and *seda de Granada* [Granada silk] (Casa de Contratación, 1557).

One of the St. Johns seals has an embossed design of either a pine cone or pineapple with a six-pointed star off to the side, while the other bears an illegible shield. Because both discs are each only one half of a two-part set, they appear to have been opened previous to the wrecking, indicating that, for reasons unknown, they were removed before the ship sank and were not part of a sunken cargo. Though they have not been found in great numbers, lead cloth seals are known from sixteenth-century Spanish

colonial archaeological contexts. A damaged lead seal, marked with an asterisk, was recovered from the mid sixteenth-century Ines de Soto shipwreck in Cuba (Escobar Guio, 1998a: 207). A portion of a lead seal that was marked with a “P” surrounded by the Pillars of Hercules was found at Santa Elena (South, et al, 1988:152).

Lead Weights



Figure 15.15. Cast Lead Cone and Fishing Weight

A small lead cone is thought to be a weight of some sort. It is 5.0 centimetres tall, and it weighs 135.28 grams, a figure that corresponds to no known units of mass. The piece has no markings, and the bottom is dimpled from the shrinkage of cooling cast metal. A second, similar item is almost certainly a weight, and probably for fishing. It consists of a small, cylinder of lead that is flattened and pierced with a small hole at one end. Apparently the piece was not heavy enough in its original form, so it was wrapped in a piece of lead sheeting to increase its mass. Together, the two components of this second weight are 4.0 centimetres long and weigh 32.56 grams.

Similar, small, conical lead weights have been found at the 1554 shipwrecks, but they all are pierced at the narrower, upper end so they could be tied to a line, presumably for fishing (Arnold and Weddle, 1978:260; Olds, 1976:56). The larger St. Johns cone might have not yet been pierced, or it might have been for use with a pan-type, balance scale, assuming that it is indeed a weight.

Pewter Ware

Very badly corroded pieces of at least one pewter plate and a single handle from a porringer have been recovered from the wreck, which, despite their poor condition, have provided enough information to reconstruct the original forms of the vessels (Fig. 15.16). In its entirety, the plate had a basin 1.8 centimetres deep, surrounded by a flat brim 2.7 centimetres wide and beaded on its underside; the

complete vessel diameter was 27 centimetres. An outline of a small shield is stamped into the underside of the brim, but any characters inside this mark are illegible because of the corrosion. The flat and relatively narrow brim is typical of known sixteenth to early seventeenth-century pewter plate forms (Cotterel, 1963:119).

Enough of the porringer's handle and bowl rim survived to allow a reconstruction of its original diameter and likely two-handled form. The outside diameter of the bowl was 12.8 centimetres, and from handle-tip to handle-tip was 20.7 centimetres.

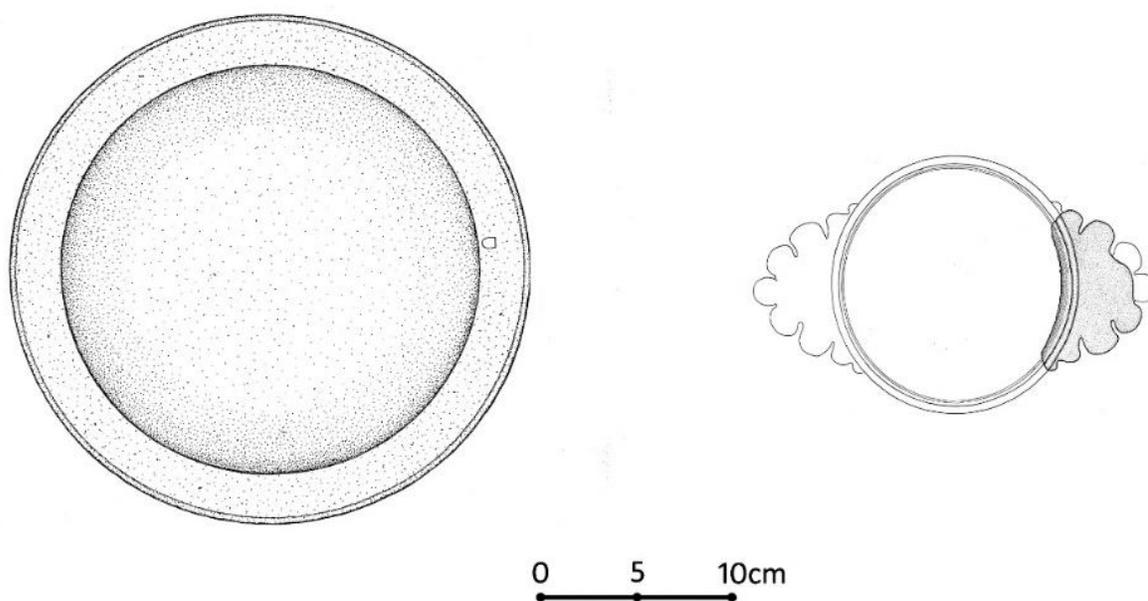


Figure 15.16. Reconstructions of St. Johns pewter plate (L) and porringer (R).

It is not possible to discern the origin for the St. Johns pewter vessels, but virtually identical pewter vessels – two plates and two two-handled porringers – as well as a smaller one-handled bowl, with all bearing English manufacturers' marks, have been recovered from the of 1554 fleet shipwreck *San Esteban* (Arnold and Weddle, 1978: 289-290). Two English pewter plates and a spoon bowl were discovered on the *Espíritu Santo*, another 1554 shipwreck (Old, 1976:141). A two-handled porringer also marked with an English Tudor-rose was discovered on the Ines de Soto shipwreck (Escobar Guio: 1998a: 205-206). Pieces of three pewter flagons, possibly of French origin, were uncovered at the ca. 1565 24M Basque whaling shipwreck at Red Bay (Dunning, 2007: 237-239). Many pewter bowls, plates, cups, jugs, spoons, and religious medallions were recovered from wrecks of the 1588 Spanish Armada, some

bearing English maker's marks (Flanagan, 1988: 122-128; 178-179). A pewter plate and spoons, also English, come from the 1622 galleon *Atocha* (Malcom, 1998). From these examples, there does appear to be a trend for small numbers of imported pewter vessels, especially plates and porringers, to have been carried on board Spanish Indies ships in the early colonial period.

Lighting Devices



Figure 15.17. St. Johns Pan-style Oil Lamp, three views

A thin-walled pan lamp is cast of resin from the concretion that formed around the original, degraded iron. The pan is 7.3 centimetres diameter and 2.6 centimetres deep. It has two scalloped, lug handles on the sides and a longer, taller, bent handle at the back (Fig. 15.17). The pan was meant to hold oil, with one end of a twisted fibre wick to be placed in it. The immersed end of the wick absorbed oil, and its other end came out from the spout at the front of the piece; it was lit at this outside end. Apparently, these pan-type oil lamps were not terribly bright, the wicks required frequent trimming, and the burning oil put out an acrid smell (Dillon, 2002:115).

The grooved slot in the longer handle indicates the pan was one of a set of two: it would have been seated in a similar, but slightly larger pan, with the lower pan designed to catch any drips or spills of oil. The two pans were joined by their longer, back handles, and the assembly was suspended on a pivoting hook and loop system (Figs. 15.18 & 15.19). This particular style of lamp is called a *candil* in Spain (Klemm, 2008:72), and though oil lamps are known to have been used in ancient times, the word *candil*, and perhaps this particular style of lamp, first appeared in 1530 (Mancho Duque, 2013). In the English-speaking world, lamps of this type were called most commonly called "crusie," "betty," or "phoebe" lamps, depending on region or the specific design of the device, and they were used well into the nineteenth century (Woodhead, Sullivan, & Gusset, 1984:29).



Figure 15.18. Resin cast of iron swivel hook and loop suspension device for a *candil*, or pan lamp.

A resin cast of a wrought-iron, swivel hook joined to a looped, twisted bar has, after comparison with images of iron *candil* pan lamps, been identified as the partial remains of such a lamp's suspension system (Fig. 15.18).



Figure 15.19. (L) Detail of two early seventeenth century *candiles* (From *Vieja friendo huevos* [Old Woman Cooking Eggs]. Diego Velazquez, 1618, National Galleries of Scotland). (R) A nineteenth-century Scottish "crusie" lamp (Allen, 1888: 89, Fig.10).

Wick Trimmer



Figure 15.20. Wick trimmer 92-1130

A scissors-like pair of wick trimmers was also cast from the marine concretion that formed around the original, degraded iron. The finely-constructed piece is 17.3 centimetres long; it has a narrow point extending from the end of one blade; the other blade is a square set on a perpendicular plane to its mate. Two rectangular piercings on the pointed blade mark where a now-missing small box was once attached. Candle and lamp wicks of the colonial period were not self-consuming and required maintenance to keep them burning neatly and brightly, and a wick trimmer was designed to do this by clipping the wick and catching any hot trimmings (Woodhead, Sullivan, & Gusset, 1984:11). The extended point was designed to straighten wick fibres before cutting, and the box was to hold trimmings. The St. Johns trimmers have “rat-tail” style bows, or finger loops, which were simply made from bent-over extensions of the handles. This style of bow was most prevalent on scissors in the late sixteenth and early seventeenth century (Deagan, 2002:207). The trimmers could have been used to maintain the wick of the pan lamp found on the site, but they might also have been used for any candles used on board. No candle holders have been found on the St. Johns shipwreck, but candles were used on ships of the era, as evidenced by candlesticks from the wrecks of the 1588 Armada vessels *Girona* and *La Trinidad Valancera* (Flanagan, 1988:129; 132), as well as the galleon *Atocha* of 1622.



Figure 15.21. Wick Trimmers and Candle Sticks. (Scappi 1570: f.24).

Scissors



Figure 15.22. Photographs of scissors 92-1008 (L) and 93-1353 (C) and drawing of two views of copper alloy bow and arm 97-2231 (R).

Two complete pairs of scissors come from the site. Both are pivot-style, with their two blades joined by a rivet (figure 20, Left and Center). One pair, 92-1008, has blades that are 7.4 centimetres long, from the rivet to the end. The other pair, 93-1353, is smaller, with blades 5.2 centimetres long from the pivot to the tip. Both pairs were originally made of iron or steel, and their forms were cast from their concretion. They are generally plain and unadorned, though pair 93-1353 has some hatching on a shield-shaped relief where the bows meet the arms. Both pairs are of the size and design that they would fall under the category of “general purpose” scissors (Deagan, 2002:208; Beaudry, 2006:125). Typical needs for scissors on board a ship might be to cut cloth or thread or trim hair and beards, though it is important to note that similarly designed scissors are found in sixteenth and seventeenth-century surgeon’s kits (Bennion, 1979:62; Kirkup, 1998b). The St. Johns scissors could have served all of these needs. Similar iron scissors have been found at Santa Elena (South, et al, 1988:152), and other, nearly identical examples have come from seventeenth and eighteenth-century archaeological contexts in the colonial US, a reflection of how little these devices changed through place and time (Noël Hume, 1991: 268).

A part of a third pair of scissors consists of a single, copper alloy bow and arm, with an overall length of 6.3 centimetres (Fig. 15.22, R). This piece appears to have once mounted onto a steel blade. This piece is slightly smaller than the bows and arms of the other two scissors. Such ornamental brass bows and arms are thought to be from sewing or embroidery scissors. They have largely been found in eighteenth-century contexts in the Americas, and they are frequently found without cutting blades, suggesting they might have been shipped separately (Deagan, 2002:209).

Straight Pins



Figure 15.23. Straight Pin, with a detail of the wrapped head (R).

Two copper-alloy, wire pins, are presumed to have been used with cloth, paper or any other easily pierced material. One is 2.6 centimetres long and consists of a wire shaft approximately 0.75 millimetres diameter. It has a head made of a separate piece of bronze wire that is wrapped around the end and fashioned into a ball-shape (Fig. 15.23). The other end is sharpened on two sides into a chisel-point. A second copper-alloy pin from the wreck is longer, at 4.3 centimetres, and it is of the same design but is bent and more corroded. The fabrication of these pins was a labour-intensive process that required as many as ten steps, from start to finish (Souter, 1824: 298-301). Straight pin technology remained virtually unchanged from the fifteenth century until the 1820's, when single-piece steel pins began to be made (Deagan, 2002:193). Virtually identical pins have also been found from Spanish colonial sites such as La Isabela (Deagan & Crucent, 2002:190), the 1554 fleet (Arnold and Weddle, 1978:291), the 1566-1587 Spanish colony at Santa Elena (South, et al, 1988:138) and the 1622 galleon *Nuestra Señora de Atocha*, suggesting such pins were widespread and common throughout the early Spanish colonies.

Piston Syringe

Components from a copper-alloy piston syringe offer rare evidence for medical equipment, aside from drug jars, to be found on this shipwreck. The domed head fitted with a "needle" with remnants of the cylindrical, barrel body was found in association with plunger remains consisting of a bronze flange fitting attached to a partial wooden handle. The cylinder has an internal diameter of 4.4 centimetres, and the domed head a depth of 2.5 centimetres, leading into the tapering needle, which is 5.2 cm long, though the tip is corroded and incomplete (figure 22). The flange fitting is presumed to have been bound with twine or leather between the two flaring bands at its end, to fill the 2 millimetre gap between it and the barrel wall. This would have prevented contact and wear of the metal components and ensured good, smooth compression.

Syringes were used from the Roman-era to the mid-nineteenth century for the irrigation of all the orifices of the human body, the mouth excluded, as well as for the aspiration of wounds, or even the inflation of collapsed lungs (Bennion, 1979:169; Kirkup, 1998a:82). The St. Johns syringe is a large piston-type device often called a “clyster,” which would have been most commonly used to administer enemas. The first use of piston syringes as a device for enemas dates to sometime in the fifteenth century (Brockbank, 1954:27) Syringes could have other, non-medical uses, too, and Diego García de Palacio suggested that syringes could be part of a ship’s firefighting equipment: “If [incendiary devices] strike the sails, one extinguishes it from the tops with water and blankets they have for that purpose, and also from the deck they throw water with syringes and the caulkers’ ladles” (1587 [1993]:338)

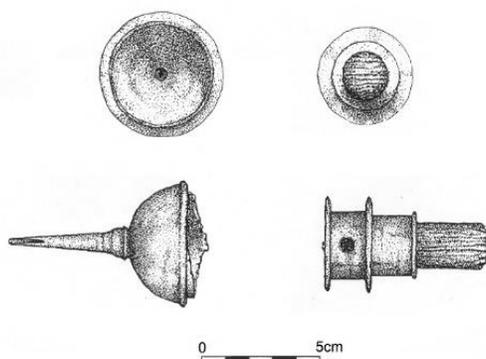


Figure 15.24. Enema Syringe. Drawing: Bob Cummings/MFMHS

Syringes have been recovered from other shipwrecks and look to have been a common component of shipboard medicine throughout the colonial era. Two syringes, one brass and one pewter, were found on Henry VIII’s flagship *Mary Rose* of 1545, but they are smaller with longer, slenderer needles and are presumed to have been for urethral applications (Rule, 1982:192). Two pieces from the 1554 fleet that appear to be syringe needles, but are misidentified as “candle spikes,” are slightly longer than the St. John’s example, at 8.6 cm and 7.8 cm (Olds, 1976:144). Two copper alloy enema syringe needles were recovered from the 1622 Tierra Firme galleon shipwrecks; one of 8.5 centimetres from the *Santa Margarita* and one of 7.1 centimetres from the *Atocha*. The 1554 and 1622 needles have slightly expanded, egg-shaped tips for easier insertion. A syringe barrel from one of the 1715 New Spain fleet wrecks found on the East Coast of Florida has precisely the same internal diameter of 4.4 centimetres, with a complete length of 22 centimetres, providing an idea for the original dimensions of the St. John’s syringe.

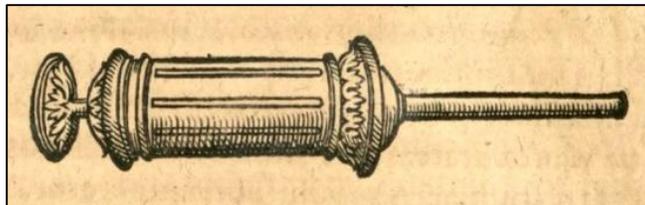


Figure 15.25. "A syringe useful for expelling liquids," (Paré, 1594: 293).

Folding Knife Blade



Figure 15.26. Two views of St. Johns folding knife blade and detail of "S" or "5" mark (R).

A small knife blade is 11.0 centimetres long and 1.6 centimetres at the widest and 1.8 millimetres thick along the spine. It is pierced by a small 1.2 millimetre hole 8 millimetres from the end of a truncated tang (Fig. 15.26). The short, squared tang with a single hole is typical for the blade of a folding knife. Knives of this type are known as the *navaja* in Spanish (Connolly, 1798:424).



Figure 15.27. Detail from *The Surgeon* showing a folding knife being used to extract a stone from a man's forehead. (Jan Sanders van Hemessen, ca. 1555. Museo del Prado, Madrid, Spain).

Medical care on early Spanish ships commonly fell under the domain of the *barbero* or the “barber-surgeon,” who carried the equipment and medicines necessary to treat the illnesses and injuries that typically occurred during a voyage (García de Palacio, 1587:322). Folding knives served as rudimentary scalpels in the sixteenth century and are seen in images of surgeon’s kits and medical practice from that time (Fig. 15.27). Colonial era sailors commonly carried *navajas* at the ready in their waistbands to serve any number of mundane uses, such as cutting line, peeling fruit, and cleaning fingernails (Pérez-Mallaína, 1998: 221). Such a knife could also serve as a handy weapon; in fact, the *navaja* was the weapon of choice in the traditional, Spanish *baratero* style of fighting (Rementeria y Fica, 1849:12). The particular purpose of the St. Johns *navaja* is not known, and it could well have served any or all of these objectives.

Locks and Key



Figure 15.28. A drawing of St. Johns lock and its mechanism made from an X-ray radiograph (L) and the encrusted lock (with a nail attached) (R).

An encrusted lock, because of its small and intricate workings, has not yet been conserved, but details have been revealed through X-ray radiography (Fig. 15.28). The lock mechanism is set in a square, iron box, approximately 7.0 centimetres square and 2.5 centimetres deep, which is mounted on a decorative faceplate. The lock could have been set into the body of the furniture (i.e. a chest or a desk) or attached to its outside surface; affixed either way via the square, box-body, which is pierced with holes for small nails or screws. A second, similar lock is represented by only the square box, minus the locking mechanism, and this second piece, too, remains encrusted.

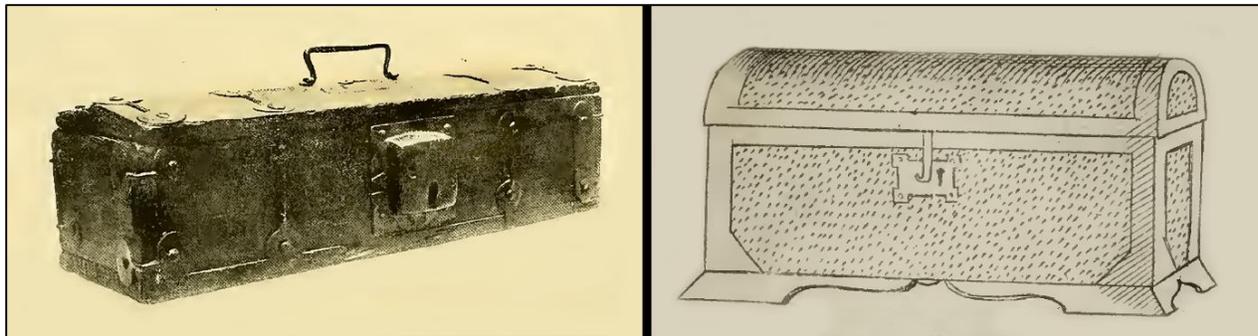


Figure 15.29. Sixteenth-century locking chests. (Artiñano, 1919: núm 295 (L); Scappi, 1570: f.25 (R)).

Many examples of such locks are found on personal chests called *arquitas* [caskets] in Spanish, or *forzieri* [coffers] in Italian, dating from the late fifteenth century through the end of the sixteenth century (Artiñano, 1919:87-94; Scappi, 1570: plate25) (Fig. 15.29). Similar locks were also linked with sliding bolts to secure doors (Labeaga Mendiola, 1992:107). Other archaeological examples from the Spanish colonies for locks of this type have been found at Santa Elena (South, 1988:72) and the wreck of *Nuestra Señora de Atocha*.



Figure 15.30. Iron key

An iron key, 6.4 centimetres long and cast of resin from concretion, is the only one found on the shipwreck. It is not known if it was intended for either of the above described locks. Similarly-styled keys of varying metal-types have been found on Spanish sites from the sixteenth and early seventeenth centuries: iron or steel keys have been found at Santa Elena (South et al, 1988:168) and the 1622 galleon *Nuestra Señora de Atocha*; bronze keys on the Spanish Armada wrecks of 1588 (Flanagan, 1988:141); and a small gold key on the Ines de Soto shipwreck (Escobar Guio,1998a:209).

Decorative Fastener



Figure 15.31. Decorative Nail or Tack Head.

An iron, flower-styled disc is cast of resin from the marine concretion. This 4.0 centimetre diameter, shaped and incised domed disc is one of the few decorative items recovered from the St. Johns shipwreck. The topside has a pronounced central button, and this button becomes a rounded shaft on the underside (Fig. 15.31). Though most of the shank is gone, the design suggests that the piece is what remains of a decorative nail or tack. Variations of round, domed iron fastener heads are found most commonly from late fifteenth to the late sixteenth-century contexts, but decorative Spanish nail heads in general date from the fifteenth to the eighteenth centuries (Artiñano y Galdácano, 1919: 81). Similarly-sized, decorative tack heads made of brass or bronze were found on the Spanish galleon *Nuestra Señora de La Concepcion*, wrecked on the island of Saipan in the western Pacific Ocean in 1638 (McIntosh & Flecker, 1990: 474). The St. Johns example probably was used to adorn a chest or a piece of furniture.

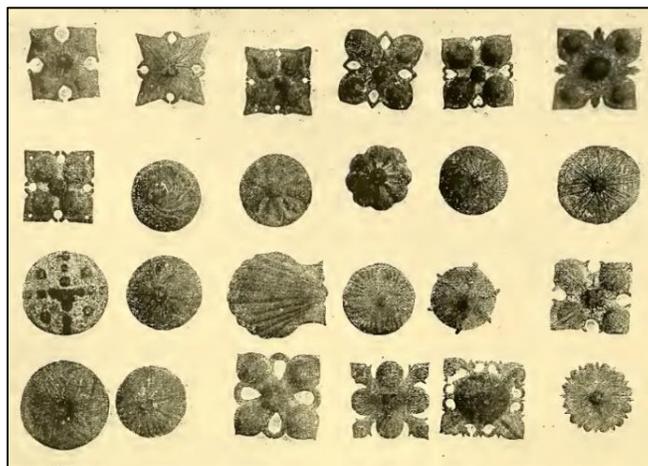


Figure 15.32. Examples of Spanish decorative tack heads. (Artiñano 1919: núm 285).

Dividers



Figure 15.33. St. Johns dividers, three views.

The presence of a set of bronze dividers on the wreck is good evidence that charts were used during the voyage. One arm is slightly corroded at the tip, but the more intact one is 9.8 centimetres long, and both have a serrated pattern cast into the upper-halves, apparently put there to improve the user's grip. Semi-circular interlocking hinges above the arms are joined at the top by a pin, and the arms pivot from this point. The design allows the dividers to be squeezed open from the sides of the curved hinges with a single hand (Fig. 15.33). Three pieces from what looks to have been one set of similar dividers was found on the 1554 *San Esteban* wreck (Arnold and Weddle, 1978:253-54), a portion of one from the Ines de Soto shipwreck (Escobar Guio, 1998b:196) and others from the 1588 Armada wrecks *La Trinidad Valencera* and *Girona* (Flanagan, 1988:64-65). Although it is presumed that these shipboard dividers were for use in the pilot's course-plotting tasks, similar devices were sometimes used by carpenters and other artisans as calipers (Salaman, 1957:108-111).



Figure 15.34. A set of dividers on top of a globe serve as the centerpiece in a collection of period navigational instruments, including an astrolabe, a quadrant, a back-staff, and a cross-staff. (Detail from Petrus Plancius, *Nova et exacta terrarum orbis* (1592), El Museo del Patriarca, Valencia).

Conclusions

The broad collection of miscellaneous objects recovered from the St. Johns wreck gives insight into routine life for those on board and evidence of the ship's purposes. From sustenance, to healthcare, to trade, these pieces illustrate the many aspects of shipboard living. People on the ship took advantage of the ocean environment and fished for food, and large meals were cooked in a copper cauldron on wood-fuelled fires. Lighting, provided by oil lamps (and possibly candles), was available to illuminate the darkness of night-time or the gloom below decks. Locks hint not only at chests or other furniture, but at a need for security or privacy on what was likely a crowded ship, with little personal space. Some medical treatment was available to those who became ill during the voyage, most notably enemas administered via syringe. Other items, such as scissors and a folding knife could have been used for minor surgery, but they could have also had other functions, from grooming to cutting line and cloth. Straight pins suggest sewing, whether repairing clothes, bedding, or even sails. A small amount of imported pewter - perhaps a more expensive alternative to ceramic counterparts, as its scarcity hints at a luxury status - offers one of the few indicators of class structure on the ship. Lead sheet was kept in the ship's general stores, to be used for maintenance. Dividers suggest that charts were being used to help plot the ship's course, an undertaking that implies other, undiscovered devices such as astrolabes and compasses were used to measure the ship's position. Other objects, such as a bar of iron, horseshoes, and cloth seals, are likely the remains of goods shipped from Spain for American colonists - indicators that trade was part of the St. Johns ship's mission. All in all, these objects illustrate some of the mundane ways in which the people on board functioned as a community and how they managed to move their lives forward from day to day as their ship carried goods across the sea.

Interestingly, there are significant elements missing from this collection of everyday objects. In particular, there are few explicitly personal possessions, and there are no religious objects, no jewellery, and no evidence of clothing – all things that were presumably dear to their owners and look to have been removed from the ship sometime after its sinking.

CHAPTER 16: THE IDENTIFICATION OF THE ST. JOHNS WRECK

When the St. Johns wreck was first discovered, there was considerable speculation that the shipwreck might be the remains of a ship dating to the earliest years of Spanish exploration of the Americas (Wilford, 1992; Toner, 1992). Ultimately, though, the archaeological evidence, both from field data and the recovered artefacts, presents a very strong case that the ship was a *Carrera de Indias* vessel, sailing no earlier than the middle of the 1550's. A closer analysis of all the physical evidence draws the specifics of the shipwreck down even further and, when compared to the historical record, allows for an identification of the vessel.

What the Archaeology Says:

The St. Johns wreck is found on a shallow reef at the edge of the Little Bahama Bank, roughly 3 miles north of a tiny, rocky islet known as Memory Rock. It is situated in 4.5 meters (15 feet) of water, just north and east of a reef that reaches to within 1.5 meters of the surface. To the west of this reef is the deep water channel that contains the northward-flowing Gulf Stream current. The wreck lies on its starboard side and represents roughly half of the vessel. Much of the hull structure is intact, with planking still butted together and fragments of framing components running perpendicularly to the planks. The presence of iron shroud chains, along with the dimensions of the wooden planks, framing components, and a keel fragment indicate that the ship was a square-rigged sailing ship between 250 and 400 tons. A large collection of artillery and hand-held weapons show that the ship was capable of engagement with adversaries, both from a distance and in hand-to-hand combat. This assemblage of weaponry falls within the range of what government regulations required of Indies ships; and with only wrought-iron artillery on board, it was even a bit under-armed. The artillery was in storage below decks when the ship sank, and the hand-held weapons appear to have been kept together in an arms-locker, suggesting the ship was not on an active military mission, and its crew was not feeling threatened at the time that the ship sank.

The ship carried items from both Mexico and *Tierra Firme* (Panama, Colombia, and Peru), and the presence of the bone of a baby caiman, a creature native to coastal South America, suggests it visited the latter. A small number of what appear to be trade goods suggest that the ship had carried such a cargo but it had been discharged or recovered. A wide array of ceramic and glass vessels, tools, foodstuffs, cooking equipment, medical equipment, and other day-to-day items show that the ships functioned as home to a community with residents who were able to sustain themselves while at sea.

There is no evidence that people perished at the shipwreck site. There are no human remains found, but this is not because of any differential preservation, as bones and teeth of other animals were found alongside much more delicate organic remains. Also, there are no pieces of jewellery and no clothing hardware (buttons, buckles, etc.) or other durable things that might be on peoples' bodies found in the collection.

There is no significant treasure found on the wreck – no ingots or coins in any large number and no evidence of precious gems. There are also no valuable personal items in the collection, such as jewellery or religious items. Contrast this situation with the 1622 shipwreck of the galleon *Nuestra Señora de Atocha*, lost with all of its treasure and 260 souls and never seen again until modern times – not only did the wreck site have artillery, weapons, ceramics and tools, but also over one thousand silver ingots, 150,000 silver coins, six thousand emeralds, and scores of pieces of jewellery and personal religious pieces. There was also the chest of the ship's pilot which contained astrolabes, dividers, a sundial compass, a back staff, ceramic jars, and a personal treasure of silver coins and gold chains (Mathewson, 1986: 115). The St. Johns wreck had virtually nothing like this, suggesting it carried no treasure or a large number of personal valuables, or that these things were salvaged sometime after it sank.

The items that are found on the ship suggest a mid sixteenth-century date, and on closer examination and taken as a whole, the collection offers a narrow window for when the ship could have been lost. It is clear that the silver coin struck at Mexico City under assayer Bernardo de Oñate was minted sometime between 1555 and 1562, and this span becomes a solid *terminus post quem* for the shipwreck. Other objects offer evidence for a *terminus ante quem*. Wrought iron artillery looks to have been used only sporadically beyond 1575-1580, when bombardeta-class guns were replaced by those of cast bronze and iron, and versos were supplanted by the musket. Crossbows fell out of favour at nearly the same time, also superseded by firearms. Many of the ceramic pieces are not known beyond 1570-1575, and before this shipwreck, the honey-glazed Melado ware is not known to have been used after 1550 (Deagan, 1987:48). When the datable objects from the St. Johns shipwreck are organized by the years in which they are known to have been used, or the periods of their peak popularity, it becomes clear that the St. Johns ship comes from a time-span that ranges between the late 1550's and the early 1570's (Fig. 16.1).

In sum, the physical remains of the wreck show that it was a sizeable ship of 250-400 tons that sank in the middle part of the third quarter of the sixteenth century. It had likely sailed to the *Tierra Firme* region of South America, and the location of the wreck along the edge of the outward flowing Gulf

Stream current suggests the ship was sailing toward Spain when it was lost. It carried no significant treasure, and there is no evidence that the people on board perished.

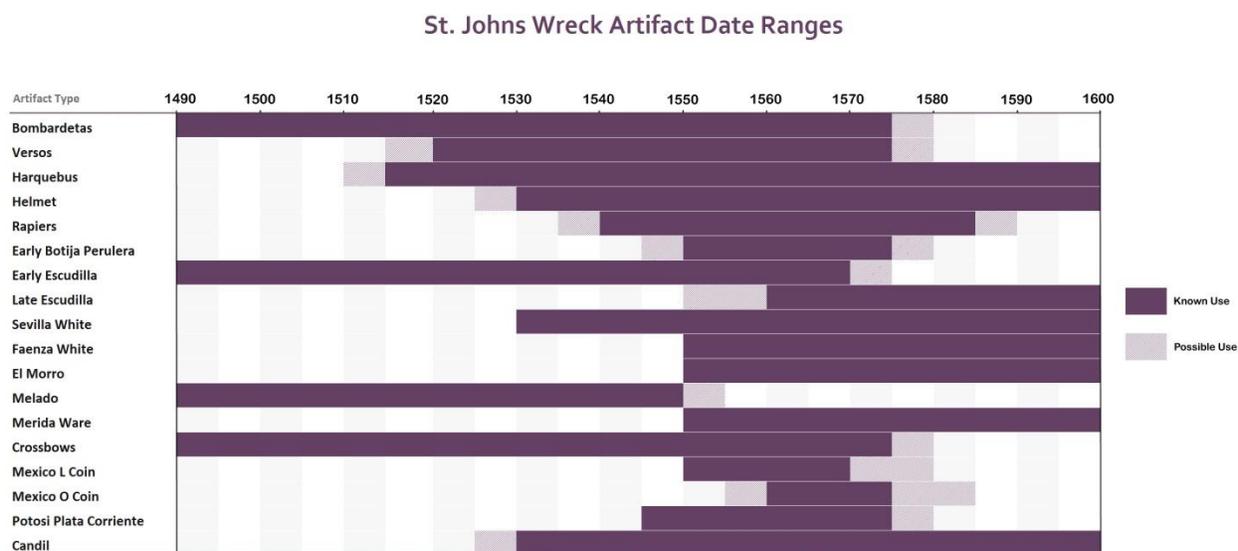


Figure 16.1. Date ranges of artifacts recovered from the St. Johns Wreck.

The Historical Record:

In an attempt to link the physical remains of the St. Johns Wreck with the historical record, two surveys of Spanish archives for information on ships lost near the site's date and place were commissioned by the Mel Fisher Maritime Heritage Society. One was done by historian Eugene Lyon of the Center for Historic Research at Flagler College in St. Augustine, and who specializes in maritime aspects of the Spanish colonial system (Lyon, 1998). The other was conducted by Victoria Stapells-Johnson, an independent researcher based in Seville, and an expert in the resources available within the Archivo General de Indias (Stapells-Johnson, 1998). These two surveys offered possible ships for the identity of the mystery wreck, but neither offered a specific candidate. Further, detailed research by this writer uncovered additional accounts of these ships. The ships identified as lost in the general area of the Little Bahama Bank between 1550 and 1590 are as follows:

| Ship's Name | Size | Date | Route | Where Lost |
|-------------------------|------|------|--------------|--|
| <i>Visitación María</i> | n/a | 1550 | Nueva España | Los Martires near Havana (i.e. the Florida Keys) |
| Galleon of Juan | n/a | 1551 | Nueva España | Coast of Florida |

| | | | | |
|--|-----------------|------|-----------------------|---|
| de Luxarra | | | | |
| <i>Santa Barbola</i> | n/a | 1551 | Tierra Firme | Bermuda |
| <i>Capitana San Andres</i> | 220 tons | 1554 | Nueva España | Exit of the Bahama Channel |
| Unidentified | n/a | 1556 | Las Indias | Coast of Florida |
| <i>Nuestra Señora de La Concepción</i> | 300 tons | 1563 | Nueva España | Unknown |
| <i>El Angel Blanco</i> | 200 tons | 1563 | Nueva España (Slaver) | Unknown |
| <i>Santa Clara</i> | 300 tons | 1564 | Tierra Firme | Mime, Mimeres, East side Bahama Channel |
| Frigate <i>El Espiritu Santo</i> | n/a (but small) | 1567 | Havana-St. Augustine | At sea |
| Frigate <i>La Concepción</i> | n/a (but small) | 1567 | Havana-St. Augustine | At sea |
| <i>La Salvadora</i> | 150 tons | 1582 | From Havana | Bahama Channel? |
| <i>San Juan</i> | 120 tons | 1586 | Nueva España | Entrance of Bahama Channel |
| <i>Santa Catalina</i> | 350 tons | 1589 | Nueva España | At Sea, End of Bahama Channel (29°) |
| <i>Jesús María</i> | 400 tons | 1589 | Nueva España | At Sea, End of Bahama Channel (29°) |
| <i>Capitana</i> | n/a | 1589 | Honduras | Florida, ca. 31°, 150-200 feet of water |
| <i>La María</i> | 350 tons | 1589 | Nueva España | Florida, ca. 31°, 150-200 feet of water |
| <i>Nuestra Señora de Guía</i> | 230 tons | 1589 | Nueva España | Florida, ca. 31°, 150-200 feet of water |

Table 16.1. Ships lost in the greater Bahama Channel area, 1550-1590.

The archaeological evidence now makes clear that the ships of 1550 and 1551 are too early to be the St. Johns site, and they are not contenders for its identification. The *Capitana San Andres* of 1554 is within the range of possibility, though, and it has warranted a closer look to understand the circumstances of its loss. Additional archival research has revealed an especially significant document, Rodrigo de Ayala's telling description of the sinking the ship's sinking:

“At the second of December, 15 ships that were under the charge of Cosme Rodriguez Farfán, left the port of Matanzas that is 20 leagues from Havana, and that went from before the Bahama channel to the entrance of it. At the eighth of December they were dealt such weather that the ship “Capitana” was opened, which was a large galleon that came from New Spain, for which El Corzo was the master, and that took on board in Havana don Antonio de Ribera, who came as General from Peru, to leave in it. And

by his importance, he took on Farfán as captain in Matanzas and put in it all the artillery and soldiers, and said at the exit of the Bahama Channel it was opened by a storm that struck them. And there the said captain took to the vessel *Bretendona* and had (by) the effort of 45 soldiers and another 22 [*II dos*], and, with full danger and effort, they took on another sixty men. And more than 20 men, who they could not take because of the severe weather, were left in the vessel and drowned there. And further, all the bronze artillery and ammunition and supplies that the *Capitana* carried remained there, and nothing could be saved, as everyone was near his end. And there were only three ships of the 15 the morning of the next day, which were the *Bretendona*, and [the ships of] Alonzo Peres Granillo and Martín García and [they sailed] in company this way until 100 leagues from the Cape of Bermuda ..." (Ayala, 1555: f.2). Clearly, the *Capitana* sank in deep water with all of its bronze artillery and over twenty souls, and, aside from its slightly-too-early date, these circumstances do not fit the profile of the St. Johns wreck.

The unidentified 1556 shipwrecks are listed as coming from "Las Indias" and were salvaged on the coast of Florida (Anonymous, 1556). It is known that a *Tierra Firme* Fleet for that year arrived safely in Spain (Sanchez, 1556). Another account, though, lists three ships coming from Puerto Rico wrecked on the east coast of Florida that year, and they might be those that were salvaged (Marx, 1987: 196). Again, these shipwrecks do not match the St. Johns wreck.

The wrecks of the 1563 New Spain fleet headed by Juan Menéndez (son of Pedro Menéndez de Avilés) are more intriguing. The fleet of thirteen ships left Havana on August 15, and on September 10 was struck by a hurricane near the latitude of Bermuda. Seven of the ships escaped the storm's fury and landed in the Azores before safely arriving in Spain; one ship sank at sea, three others limped southward to Monte Cristi on Hispaniola; two others, the *Capitana Nuestra Señora de La Concepción*, with Juan Menéndez on board, and the slave ship *El Angel Blanco* were lost (Lyon, 1976:29-30; Chaunu & Chaunu, 1955b:65-67).

The record is clear that these ships were total losses; the *Concepción's* owner, Juan Venegas, said flatly, "...it is my understanding that the ship is lost with everything that went in it..." (Venegas, 1564, f.22). Some of what was lost was revealed in earlier testimony by the ship's master, who stated that the *Concepción* carried four bronze guns: "... that there go four pieces of artillery of bronze with the ammunition for them ..." in the ship (Alicante, 1562: f.20), a fact that was confirmed by Pedro Menéndez when he said the *Concepción*, "...carried thirty soldiers with their weapons and supplies and four pieces of artillery with the gunpowder and necessary ammunition..." (Menéndez de Avilés, 1563a: f.19).

There is also good historical evidence that the two missing ships were dashed upon Florida's Atlantic coast. A Frenchman named Stefan de Rojomonte captured by the Spanish, in an account about the situation of the French in Florida, described Juan Menéndez' wrecked ships in 1564: "It is understood to be certain that the ships that the Indians say are lost on the coast of Florida are those of don Juan Menéndez, and the men who walk among them do much to win the friendship [of the Indians] and it would be an easy thing to find them, for the French say they are along Cape Canaveral." (Rojomonte, 1565: f.4).

Survivors of the 1563 disaster were seen and spoken to by Hernando de Escalante Fontaneda, a Spanish castaway who lived for many years with the Native peoples of the Florida Keys. He wrote of this encounter, "Other vessels have been lost, among them the armada of New Spain, of which it was said the son of Pedro Melendez [i.e. Juan Menéndez] was General, for the Indians took a Spaniard that reached the shore whom they found starving. And I saw him alive and talked with him and one Juan Rodriguez, a native of Nicaragua. He told us that they came from New Spain and were going to Castile; that the General was a son of Pedro Melendez, the Asturian; that he came as a sailor in another vessel; and that the people of neither knew anything of what had befallen the other, until the Indians armed themselves to go to the coast of Ais [the shoreline from Palm Beach to Cape Canaveral], when he saw them go and return with great wealth, in bars of silver and gold, and bags of reales, and much clothing." (Escalante, 1575 [1854]:33).

In 1565, the Englishman John Hawkins visited the French outpost of Fort Caroline in North Florida and noted that the Florida Natives were getting silver and gold by salvaging what were likely these same shipwrecks, "...how they came by this golde and silver the French men know not as yet, but by gesse, who having travelled to the Southwest of the cape [Cape Canaveral], having found the same dangerous, by means of sundry banks, as we also have found the same: and there finding masts which were wracks of Spaniards comming from Mexico, judged that they had gotten treasure by them" (Sparke, 1565 [1906]: 126).

The 1563 Juan Menéndez ships do not fit the profile of the St. Johns wreck in that not only did they apparently sink on the Florida coast, they both sank with treasure, much loss of life, and the *Concepción* carried bronze artillery. The *Angel Bueno* was a slave ship, and had apparently discharged its human cargo in New Spain in exchange for Mexican silver, and evidence of those activities, not only a significant quantity of silver, but shackles or some other suggestion of the slaving business would likely be preserved in the ship's remains.

The *Santa Clara*, sunk in 1564, is the most compelling of the ships known to have been lost in the area during the time of the St. Johns wreck. *Santa Clara* was one of three ships owned during the period by the Captain-General of the Indies fleets, and future founder of Spanish Florida, Pedro Menéndez de Avilés. These ships were merchant vessels in the *Carrera de Indias*, and Menéndez used them as a source of income by charging freight and passenger fares. *Santa Clara* appears in registries as both a *nao* and *galeón* of 300 tons (Chaunu & Chaunu, 1955b: 38-39).

On November 9, 1563 *Santa Clara*, *San Pelayo* and *Magdalena* left Cádiz for *Tierra Firme* with the important passenger the *Licenciado* Lope García de Castro, who had been designated the interim viceroy of Peru and president of the *Audiencia* of Lima. The ships were soon caught in a storm, though, and were battered and dispersed by the inclement weather and forced to return to port. Repairs, costing approximately 20,000 *ducados*, had to be made before the fleet could leave again.

In the early spring of 1564, the small fleet once again left Spain under the command of Esteban de Las Alas, Pedro Menéndez de Avilés' lieutenant. The *San Pelayo* served as *Capitana*, and the *Santa Clara* sailed as *Almirante* of the small fleet, with Juan Diaz Bozino as master. After first calling at Colombian ports, they arrived at Nombre de Dios (Panama) on the first of June, where, according to Las Alas, "The merchandise that goes into Nombre de Dios holds good value. Those that travelled on the *flota* noted that 100% was traded...a *botega* [*botija*] of wine sold at 2 *pesos* and 2 *tomines* assayed" (Las Alas, 1564). The fleet stayed in Panama until the August 12 or 13, when they then continued the voyage and returned to Colombia. Shortly after, the *Magdalena* was somehow damaged and returned to Nombre de Dios for repairs. On August 28, the two ships *Santa Clara* and *San Pelayo* arrived in Cartagena.

They remained there until September 20, but provisions were scarce in Cartagena, so, despite the late date at the height of hurricane season, the diminished fleet of two was forced to leave for Havana. The ships could not enter that port because of rough weather, and Las Alas made the decision to carry on to Spain. In the darkness of the early morning of October 6, *Santa Clara* struck a reef at the mouth of the channel, on the eastern side of the Gulf Stream, and it was trapped in the shallows. With the ship hopelessly unable to sail, the majority of the day was spent removing the stranded passengers, crew, and cargo of Peruvian silver onto the *San Pelayo*. *Santa Clara* and its equipment were abandoned. The heavily loaded *San Pelayo* continued on to Spain, and it arrived at Cadíz on December 5, 1564, when Las Alas wrote his letter that described the voyage and *Santa Clara's* loss.

The only other ships that fall within the time-range of the St. Johns wreck are the two frigates *El Espiritu Santo* and *La Concepcion* of 1567. These vessels were sailing from Havana to St. Augustine and they appear to have been lost at sea. As frigates, they would have been small vessels, too small to match with the hull structure found at the shipwreck site. The remaining ships found by Lyon and Stapells-Johnson all sank in the 1580's, and they are too late to match the artefact profile of the St. Johns wreck.

The analysis of the ships known to have wrecked in the Florida/Bahamas region during the mid to late sixteenth century points toward the St. Johns ship as being the *Santa Clara* of 1564, as the date, size, artefacts, and general circumstances match the descriptions of the ship. A further, more-detailed look at exactly where the *Santa Clara* was lost, and how the material culture associated with the ship in the historical record compares to the St. Johns wreckage, affirms this identification.

Where *Santa Clara* Wrecked

When Esteban de Las Alas described the loss of the galleon *Santa Clara* to King Philip, he said, "On the sixth of October, at four in the morning, in the place they call *El Mime*, which is in the Bahama Channel, the waters drove us to the east side, and the galleon *Santa Clara* struck a shoal" (Las Alas, 1564). Las Alas' description clearly places the shipwreck on the eastern side of the Bahama Channel, but there are other eyewitness accounts describing the loss, and when they are added in, along with sixteenth-century charts and sailing advices, the combined descriptions help to narrow the locations of both the Bahama Channel and "El Mime" even further. Additional designations for the place Where *Santa Clara* wrecked, as well as further descriptions of where that place is, come to light. Aside from Las Alas' "El Mime," other, similar names are given: "Los Mimes," "El Mimere," and, most commonly, "Los Mimeres" are all presented in eyewitness testimony as the name of the reef where *Santa Clara* ran aground and was abandoned (Table 16.2).

| Witness | Description | Source |
|--------------------------|--|---|
| Juan Vázquez de Coronado | "...it was reluctantly accepted to embark for the Bahama Channel, and in los Mimes , at night, the said ship Santa Clara touched a shoal..." | Justicia 875, n.3, F.3V-4 (Anonymous, 1565) |
| Diego Caro [de Mesa] | "...they embarked for the Bahama Channel; in shoals that are called Los Mimeres , the ship Santa Clara was lost..." | Justicia 875, n.3, F.9V (Anonymous, 1565) |
| Julian García | "The said two ships and more for going in demand of Havana, and the pilot and master said that they could not take it and entered for the Bahama Channel and in a shoal that is said to be called Los Mimeres , at dawn one day and the ship Santa Clara ran aground in the shoals and was lost..." | Justicia 875, n.3, F.12 (Anonymous, 1565) |

| | | |
|---|--|--|
| Esteban de Las Alas | "...they went into the Bahama Channel, and at the sixth day of the month of October past, two or three hours before daylight, the galleon Santa Clara touched in shoals that are in the place called Los Mimeres... " | Justicia 875, n.3, F.17V (Anonymous, 1565) |
| Alonso Rodriguez de Huelva | "...they could not take Havana, and, from it, entered the Bahama Channel, and at the outlet, in the shoal of Los Mimeres , the galleon Santa Clara went aground..." | Justicia 875, n.3, F.21V (Anonymous, 1565) |
| Geronimo de Maya | "...they could not take Havana and exited for the Bahama Channel, and, watertight and at the mouth out [outfall/exit], the galleon Santa Clara was lost in Los Mimeres at two of the night (2:00 am)..." | Justicia 875, n.3, F.25V (Anonymous, 1565) |
| Diego Hernández de Serpa | "And this way they entered for the Bahama Channel and in a shoal that is called Los Mimes , the ship Santa Clara was lost..." | Justicia 875, n.3, F.7 (Anonymous, 1565) |
| Sancho de La Vinuera/Vinera | "...they came in demand of Havana and were unable to take it...and exited for the Bahama Channel and in the shoals that they call Los Mimeres the ship Santa Clara was lost..." | Justicia 875, n.3, F.28V (Anonymous, 1565) |
| Antonio Vaca de Castro | "...it could not take the port of Havana as the men of the sea desired that there was, and that it was given a course/tack to the sea, and at dawn the ships found themselves over ones called Los Roques that is at the mouth of the Bahama Channel and could not go back, and in this manner they entered the mouth..., and that before they exited from the Channel, the almiranta ship ran aground in the shoals that are called Los Mimeres... " | Justicia 875, n.3, F.39V-40 (Anonymous, 1565) |
| King Philip II (quoting Pedro Menéndez de Avilés) | "The general Pedro Menéndez de Avilés had related to me that two of his galleons, coming sailing through the Bahama Channel in the month of November past, with a quantity of my money and that of private individuals, one night in the said month one of them drove upon a shoal that they call El Mimere... " | Indiferente, 1966, L.15, F.212V-213 (Philip II, 1565c) |
| Geronimo de Maya | "...going into the Bahama Channel, the said Esteban de Las Alas with the galleons San Pelayo and Santa Clara in one day of the said month of October of the said year of five hundred and sixty and four years; before dawn, the said galleon Santa Clara touched in the end of the said Channel in a shallows , of a manner that was necessary and forced, because it was broken on the bottom, for abandoning..." | Justicia 905, n.2, F.33 (Anonymous, 1571) |

Table 16.2. Excerpts from eyewitness accounts of the 1564 loss of the galleon *Santa Clara*.

The Bahama Channel

The Bahama Channel (also known as the Gulf of Florida) is an older term that generally describes the passage between the east coast of Florida and the banks of the western Bahamas (Sociedad de Literatos, 1831:676). At its southern end, the channel is defined by the confluence of the Florida straits and Old Bahama Channel, where they join together just above the Cay Sal Bank. Its northern end is defined by the north-western point of the Little Bahama Bank, at approximately latitude 27°30'N, where the waters flow into the open Atlantic Ocean (Fig. 16.2). The Bahama Channel runs for approximately

320 kilometres (200 miles), from the Upper Florida Keys to Vero Beach, Florida on the western side, and on the eastern side it stretches from the Great Bahama Bank to the northern end of the Little Bahama Bank. The channel ranges between 80 and 110 kilometres wide. Today, this passage is commonly recognized as a part of the Straits of Florida (National Oceanic and Atmospheric Administration, 2008). From a sailor's standpoint, the channel is most notable for the strong, northward-flowing Gulf Stream current, which achieves its greatest speed through this bottleneck, with a surface flow of up to 5 knots (Richardson, 2001).

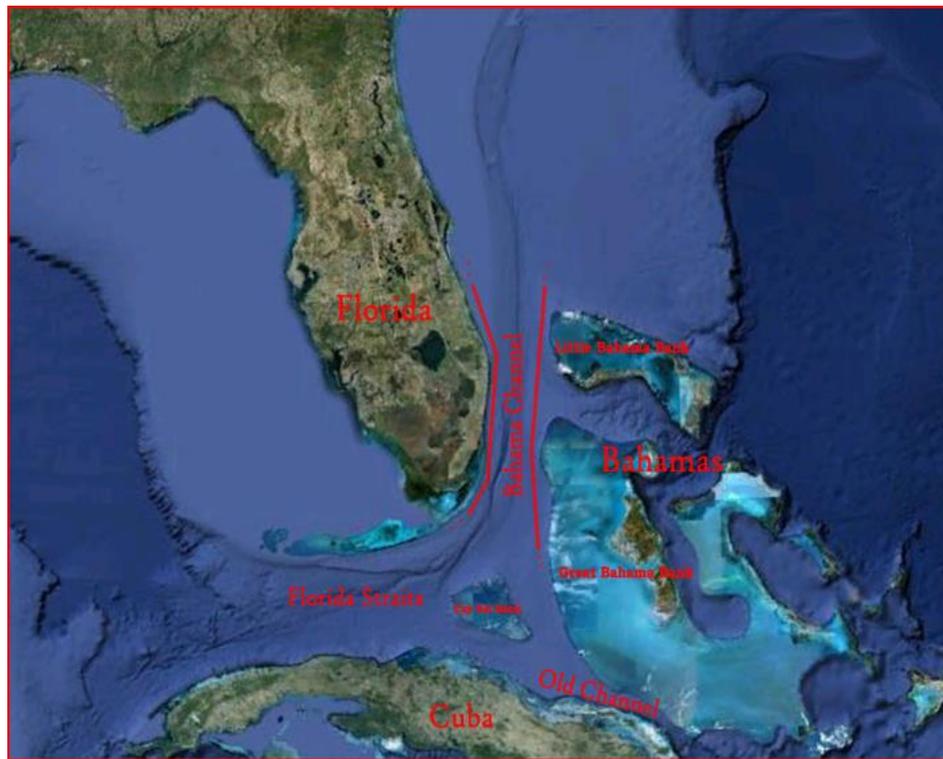


Figure 16.2. The location of the Bahama Channel. (Base image Google Earth).

The Spanish fleets came to rely on the Bahama Channel's favourable currents to help guide the ships toward the Iberian Peninsula on the return voyage in the *Carrera de Indias*, a route that was largely dependent on wind patterns and ocean currents. Starting from Spain, the ships rode the Canary current to the North Atlantic subtropical gyre, which helped to carry them westward across the ocean. In the Caribbean Sea the currents continue to trend westward, ultimately exiting at the northwest outlet of the basin, between Cuba and the Yucatan Peninsula, and into the Gulf of Mexico (Gyory, Mariano, & Ryan, 2013). The currents then enter Florida Straits (the constriction between the north coast of Cuba, the Florida Keys, and the Bahamas) where the flow becomes the powerful Gulf Stream Current. In 1513,

during the first Spanish exploration of Florida, led by Juan Ponce de Leon, the Gulf Stream was documented by Europeans for the first time. It was said, “they saw such a current that, although they had a strong wind, they could not go forward, but rather backward, and it seemed that they were going on well; and finally it was seen that the current was so great it was more powerful than the wind” (Davis, 1935:17). Anton de Alaminos, a pilot in the Ponce de Leon voyage, made note of this powerful “river” in the sea. Later, in 1519, Alaminos, piloting another expedition, figured that such a tremendous flow had to exit somewhere, and he overcame the standard belief that the reef-fringed, narrow straits between Cuba and Florida and Florida and the Bahamas were too dangerous to sail through. For the first time, he utilized the Gulf Stream to sail from Cuba, through the Florida Straits and the Bahama Channel for the return voyage to Spain (Chamberlain, 1948). With the significant boost in speed and shortened sailing time that was realized by this track, Alaminos’ newly-discovered route quickly became the standard course for the return voyage from the New World to Europe. The narrow, north/south passage between Florida and the Bahamas was referred to as the “Canal de Bahama,” which differentiated it from the original outward route that had been used in the earliest decades of Spanish exploration of the Americas, which ran between the Bahamas and Cuba and Hispaniola. After Alaminos’ discovery, the earlier route was quickly dubbed the “Canal Vieja,” or Old Channel.

“Mimere, Mime, Mine, Mimbres”

The shoal that *Santa Clara* struck was referred to as “Mimere” (or its variants), but, as there is no place recognized by that name today, the whereabouts of this reef are not obvious. As the Bahama Channel was increasingly utilized through the sixteenth century, though, maps and other documents were generated that reveal the origins and evolution of the term’s usage. An investigation of these documents show that versions of *Mimere* were in use by 1550, and the name continued to be used regularly to describe areas of the Bahama Channel in the centuries after the loss of *Santa Clara*.

When Juan Ponce de Leon was given permission to explore the areas north of Cuba, his agreement allowed him to explore and populate the island of “Bimyny” (Ferdinand II, 1512). This appears to have been the name then utilized in those first few decades after Juan Ponce’s voyage for the shoals and islands of the western Bahamas. In 1529, much of the north/south stretch between Florida and the Bahamas, from Cuba to above the north-western Bahamas, is labelled on a map “Tera de beminy” (Ribero, 1529). The label is written twice; each notation alongside one of the western edges of the two Bahama Banks (Fig. 16.3).



Figure 16.3. Detail from Ribero's map of the Indies showing "Tera de beminy" written twice in the space between the Bahamas and Florida (1529).

At some point in the first half of the sixteenth century, permutations of the name Bimini began to be used to describe the area. For example, a 1550 map by the Portuguese cartographer Jorge Reinel depicts the Great and Little Bahama Banks in relatively-good detail and where they meet with the eastern side of the Bahama Channel is labelled as "memeno" (Fig. 16.4) (Reinel, ca. 1550). Though the reasons for the change in name are not clear, it seems likely that there was simply a tendency for mapmakers like Reinel to misinterpret or misspell what they had seen in earlier works.

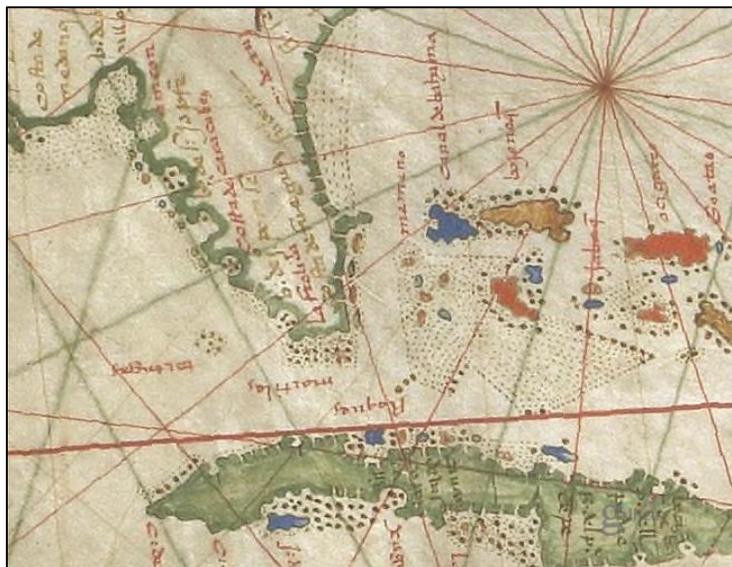


Figure 16.4. Detail from a mid sixteenth-century chart shows the western Bahamas labelled "memeno." (Reinel, ca. 1550).

the north-northwest and it is in latitude twenty-seven and one-half degrees, and to sail out securely continue to go until a latitude of twenty-eight degrees..." (Puebla, 1578:f.58R).

A few years later, in 1594, a geographer's account of the Indies further describes the area of "Mimeres" this way: *"The two Indies [New Spain and Tierra Firme] have many islands in the sea to the north, but the principal is that of Haiti, named Hispaniola, [also] ...The Lucayos [Bahamas], Islands of Bimini, corruptly called Mimeres, [are] of dangerous shoals for those that sail through the Bahama Channel..."* (Zamorano, 1594:83-84).

At nearly the same time, in 1595, Juan Maldonado Barnuevo, the governor of Cuba, ordered a survey of the Bahama Channel and the Florida coast. The survey, conducted by a team that included three pilots, resulted in a report that is a rich source of information for the geography of the area at the time. The many place names are linked with directions and latitudes, making the locations certain. The Maldonado survey describes the areas of Mimeres in the following manner:

Going out from this Cay Sal to the northeast they go to give in the head of Los Roques [Dog Rocks or Damas Cays, on the eastern edge of Cay Sal Bank]... From these rocks we steered to the east some twenty-four leagues across the north/south Channel until entering in the [shallow] sea-bottom of the Mimeres; from there we steered to the north; the sea bottom ran long until arriving at the Keys of the Mimeres. They run, these keys, from north/south; they have the length of one league.

Between them, [there is] a large mouth there that has three brazas [4.5 meters/15 feet] of water. Of the part of the east, right next to there, is six or seven brazas of water – in the sea-bottom of the part of the east there are two or three brazas; all clear sand. [We] took the [sun's] height onshore at these keys on the June 10: eighty-eight degrees of the astrolabe of the largest height (25°02'N; Orange Cay). Coming out of this Mimere, [we] steered to the north-northeast, the sea bottom ran long. We went toward three fariñones (?,"blood sausages") of the Mimeres, which are one like the others. They run as three leagues north-northeast/south-southwest. [We] took the altitude onshore of these on June 11, of eighty-six and one-half degrees of the astrolabe for largest height (26°37'N; Grand Bahama).

[We] left from these Mimbres, turning for the north-northwest. [There is] a sandbar from the sea bottom of three brazas of water; one clear, for four leagues. From these Mimbres, we crossed the Bahama Channel towards the northwest, and to the west, to the coast of Florida, you will have the Channel twenty leagues [wide]... (Maldonado Barnuevo, 1595).

Bahama Banks, lined with reefs and shoals punctuated by islands, and fringing the Gulf Stream, could be considered evocative of either of these definitions.

The term *Mimeres* is once again used in a map of the Greater-Florida region dating to around 1600, which very clearly shows the label applied to the waters and reefs fringing to the west side of Grand Bahama and the Little Bahama Bank (Fig. 16.6).

In 1601, the chronicler of the early Spanish colonization of the Americas Antonio de Herrera y Tordesillas wrote a description of the Indies, and in his account of the Bahamas, much as was seen in the 1595 survey ordered by Cuba Governor Barnuevo, he uses the term “*Mimbres*” to describe the same area near Grand Bahama island:

“The islands that are to the north of San Juan, Hispaniola, and Cuba, of which none is populated by Castilians, they are called of the Lucayos [Bahamas]. For one, more north, that is above of twenty-seven degrees high, which there is called Lucayoneque or Yucaoneque [Abaco], which it has almost to the West one [called]Bahama, another island in twenty-six and a half degrees - thirteen leagues long and eight wide - from which the Bahama channel takes its name, [which is] between Florida and the shallows of the Mimbres, where such strong currents of the sea go northward; that although the wind is strong the sailors cannot go with it, and although it [the wind] is opposite, they go out with the currents.” (Herrera y Tordesillas, 1601:37).

Herrera’s use of *Mimbres*, instead of *Mimeres*, to describe the reefs and shoals fringing the edges of the Bahama Banks, reflects what appears to have become a shift in place-name for the area and what would to be seen as the standard term for it across the next two centuries. This shift is echoed again in the 1650’s, when the New Spain galleon *Nuestra Senora de Las Maravillas* wrecked on the western edge of the Little Bahama Bank, near latitude 27°30’N: the location of its loss was described as the “*paraje de los Mimbres*,” or “place of the Mimbres” (Philip IV, 1656). Over the next few decades, and then well into the eighteenth century, the western edges of both the Great Bahama Bank and the Little Bahama Bank are shown on charts as “*Mimbres*” (Fig.16.7) (Guillaume de L’Isle, 1703; Augustin de Orttuz, 1747).

Interestingly, and in a trend that links closely to today’s terminology, the remote, barren islet at 26°56’N, on the western edge of the Little Bahama Bank, begins to be designated on later-eighteenth century charts as “*Membrey*” Rock (Catesby & Edwards, 1754) and “*Member*” Rock (Speer, 1795). Eventually, the name was fully Anglicized to Memory Rock, the term by which it is known today. One

must wonder if this evolution to the modern name might have occurred at some earlier time, as Memory is a near-homophone to the Spanish pronunciation of *Mimere*.



Figure 16.7. Detail from a 1703 map showing areas of both Bahama Banks as “Mimbres.” (de L'Isle, 1703, *Carte du Mexique et de la Floride des Terres Angloises et des Isles Antilles*. Library of Congress, Washington, DC).

From the historical evidence, it is clear that through the early colonial period the western edges of the Great and Little Bahama Banks underwent a series of name changes, shifting roughly from Bimini, to *Mimene*, to *Mimeres*, to *Mimbres*, with a number of related variations used idiosyncratically. Comparing the terms used in eyewitness accounts to describe the place where the galleon *Santa Clara* ran aground in 1564 - *Mimeres*, *Mimere*, *Mime*, *Mine* - to other aspects of the historical record, the site of the ship's loss is without a doubt found somewhere along the east side of the channel that runs between Florida and the Bahamas, as those were terms used to describe that particular area in the mid to late sixteenth century. Some of the eyewitnesses to *Santa Clara's* loss provided additional details, that more specifically identify the place of the ship's loss: Alonso Rodriguez de Huelva, master of the *San Pelayo*, said *Los Mimeres* was at the outfall of the Bahama Channel; Geronimo de Maya, pilot of the *San Pelayo* describes *Los Mimeres* as being at the outward mouth of the Bahama Channel, and in later testimony, he stated that “the said galleon *Santa Clara* touched in the end of the said channel;” Antonio Vaca de Castro said that “before they exited from the channel” the ship ran aground. All of these supplementary descriptions place the grounding site at the end of the Bahama Channel, close to its exit. Knowing that this channel, with its strong south to north flow, ends at the north-western edge of the Little Bahama Bank at approximately 27°30'N, the reef or shoal where the galleon struck would have to be near, but below, that latitude, north of the western end of Grand Bahama Island.

Historic Accounts of the 1563-1564 Fleet's Material Culture

From the time the 1563-64 *Tierra Firme* fleet was first organized in the summer of 1563, with the mission to carry the licentiate Lope García de Castro to Panama, to disputes over monies owed that carried into the 1570's, a large body of paperwork relating to the ships and their voyage was generated via a variety of bureaucratic channels. This collection includes letters, decrees, lawsuits, travel permits, and miscellaneous governmental writings. Though there are no formal lists of properties or equipment on board the ships have yet been found, there are references to various objects and goods associated with the fleet contained in the known papers. By looking at the material goods mentioned in the fleet documents, evidence of what items should, and should not, be on the wreck of the *Santa Clara* is gleaned. This information can then be compared to the St. Johns wreck materials. (Note: All material goods are highlighted in bold.)

Shortly after the three galleons – *San Pelayo*, *Santa Clara*, and *Magdalena* – were permitted to sail, they were inspected. The inspector found the ships unready, especially *San Pelayo*, and in his list of faults details about the rigging of the ship are noted: "...in the said ship they had not made carpentry work, and likewise were caulking of the **canitas** [?] over which is the principal work of the ship, and lacking for putting up the **topmasts** [*masteles de gavia*] and **main yard and others**, nor is the **main mast** set, nor the **rigging darkened** (tarred?) [*jarcia atesada*], nor the **tackle-pendants/ swiftners** (heavy line to support cargo-loading) [*amantes*] with **their equipment**, nor **the sail luff** (leading edge) [*envergadas*] linked with **the masts or yards**, except the **mizzen**, nor are the **ratlines** made in the **shrouds**, ...and likewise the **artillery** and **munitions** are not put where they have to go ..." (Salinas, 1563).

Some of the details in this inspection are obvious and generic to ships of the time, some are not. The need for carpenters and caulking implies planked, wooden hulls – something common to virtually all sailing ships of the sixteenth century – and this construction is certainly seen on the St. Johns wreck. And though there were none of the mentioned masts, lines, or sails found on the site, "ratlines," and "shrouds," do link directly with artefacts from the St. Johns wreck. A row of eight iron shroud chains was found on the eastern edge of site. These chains were designed to hold wooden deadeyes to the hull. The shrouds, standing-rigging lines that ran to the top of the mast, were connected to these deadeyes. Tied between the shrouds were ratlines - smaller, horizontally-strung lines - which the crew could use as a ladder to climb to the upper works of the ship. Indeed, the shrouds and ratlines listed in Salinas' testimony could not have existed without shroud chains. Other rigging is represented by metal coaks from pulley blocks, as well as a type of cargo hook.

Once the fleet had crossed the Atlantic, the licentiate Lope García de Castro, the newly-appointed president of Peru, and passenger on *San Pelayo* wrote a letter to King Philip to apprise him of his progress and of the nature of the colonies. Upon arrival to the Indies, Castro made a short reference to two specific types of weaponry used by the fleet. He said, "...we wanted to take water in Dominica and sent **twelve harquebusiers** and **two versos** in the **shallop**." (García de Castro, 1564a).

Immediately upon his return to Spain, the commander of the 1564 Tierra Firme fleet, Esteban de Las Alas, also wrote King Philip to tell him of the loss of the *Santa Clara* and other details of the return voyage to Spain. In his account Las Alas mentions many of the supplies, cargoes, and objects associated with the ships (Las Alas, 1564). In one notation he said "...in Cartagena they had no **biscuit**, no **cassava**, no **corn** [*maiz*], nor **meat**." Las Alas was citing a lack of availability of these supplies, but his want of them reflects a familiarity with these items. No biscuit, cassava, or corn were found on the site, but bones, and pig's teeth that do indicate the consumption of meat; nuts and seeds represent other foodstuffs on the ship. Though there is no list of the merchandise carried by the ships to the American colonies, Las Alas does note that what they had sold well and that "the **botija of wine** was worth two *pesos* and two *tomines*, assayed" (ibid.).

Later in the return voyage, Las Alas described how the *Santa Clara* ran aground "and it fired **a shot**, and lit **a lantern**..." to signal the *San Pelayo* of its plight (1564). Interestingly, one of the versos found on the St. Johns site was off on its own, well away from the other artillery. In looking at the layout of the site, this isolated rail-gun would have been sitting high on the bow of the ship (Fig. 16.8). The location of this one gun, away from the others, which all appeared to be in storage, is intriguing in light of Las Alas' description of a signal. As for lanterns, no larger ship's-lanterns have been found on the St. Johns wreck. A small oil lamp indicates one type of lighting on board the ship, but it is not clear if this is the type of lantern described by Las Alas.

Aside from delivering Lope García de Castro to Panama, another purpose of the fleet was to carry treasure from the Americas to Spain, and both the *Santa Clara* and *San Pelayo* carried silver and gold. Esteban de Las Alas wrote to King Philip of the treasure he brought from the *Santa Clara*: "From the galleon *Santa Clara* comes for His Majesty **one hundred and sixty-five bars**...and nearly **four thousand castellanos in gold**, and for individuals **some five hundred and seventy bars of silver** and **seventeen parcels of gold**...and **seventeen boxes of plata corriente**." (Las Alas, 1564). No silver bars or parcels of gold have been found on the wreck during this study, but three pieces of *plata corriente* were found

during excavation. And at least three small, unmarked silver bars were found at the site by salvagers in the 1980's.

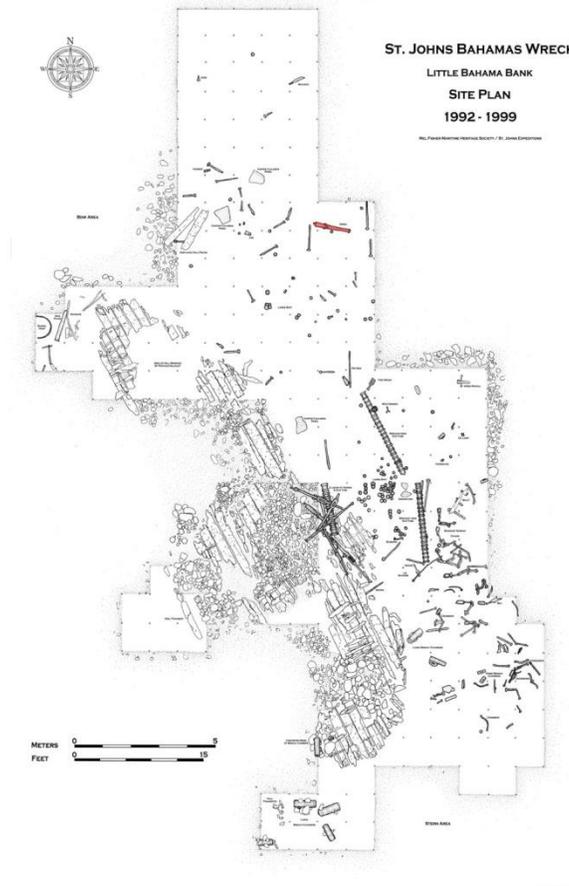


Figure 16.8. Site plan of the St. Johns Bahamas shipwreck, with isolated verso found at upper bow in red.

After *Santa Clara* wrecked, a caravel was chartered by Las Alas in the Azores to relieve crowding on the overloaded *San Pelayo*. A relatively long list of goods placed onto the caravel gives a good sense of supplies and weaponry carried on Las Alas' ships, especially during the return voyage. "... the said Señor General put into the said caravel **six pieces of artillery** and the **powder** and **munitions** necessary... And likewise **one half-dozen shields**, **six harquebuses**, **six crossbows**, **one dozen pikes**, **three hundredweight of biscuit**, **eight botijas of wine**, **five hundred mackerels**, **one arroba of oil**" (Las Alas, 1571). Many of these listed items are found on the St. Johns site. Las Alas, just as the licentiate Castro had at Dominica, again references harquebuses. Six crossbows were also transferred to the caravel, and nine such weapons were found on the shipwreck. The same is true for pikes; a leaf-style pike, and other,

related pole-arms, have been uncovered. No shields are seen from the St. Johns wreck (though breastplates and helmets are). As for the supplies, biscuit and mackerels have not been encountered, but Las Alas' mention of *botijas*, establishes that these earthenware vessels were carried on the fleet's return voyage. The *arroba* of oil was also likely held in such jars, as it has been noted that oil was commonly carried in $\frac{1}{2}$ *arroba botijas*, according sixteenth-century shipping lists (Marken, 1994: 48-49).

After the return of the *San Pelayo*, Esteban de Las Alas outlined purchases he had made during the voyage, so he could be reimbursed for them by the *Casa de Contratación*. His accounts again list many specific goods used on the ships. One account says, "What I, Esteban de Las Alas, had paid; which has to be repaid to me from the *avería* [tax on Indies ships], for the following: **a lantern, flour, two quintals of candles, another lantern** which cost *Holanda* [cloth] and **stores and lead and wood, and one quintal and an arroba of worked white wax for the lantern** (1571b). Again, aside from a small oil lamp, no ship's lantern was found at the wreck site; neither was flour, nor wax. But the St. Johns ship did likely utilize candles, as evidenced by a pair of candle-wick trimmers. Las Alas also said cloth was part of the trade for the lantern, and evidence of cloth is seen from the St. Johns shipwreck in the form of lead seals.

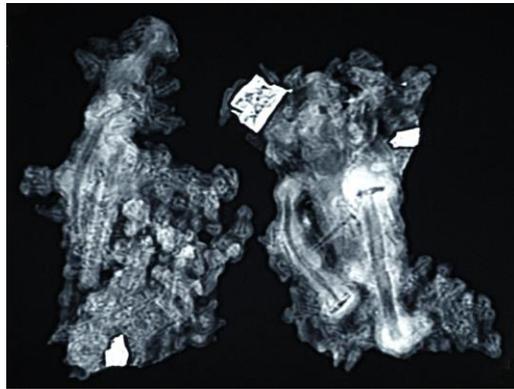


Figure 16.9. X-ray radiograph of conglomerates of iron tacks and nails recovered from the St. Johns wreck.

The man who constructed the new lantern gave even more detail of the trade: "...General Esteban de Las Alas paid to Pedro de Castro... thirteen pesos; [in the form] of **six varas of Holanda** [cloth], and **four varas of Mengala** [Indian cloth], and of **thirty varas of tranzaderas** [plaited cloths or ribbons] and **tacks** [*tachuelas*], to make the lantern..." (Castro, 1564). Castro elaborated on the varieties of cloth, and he also said tacks were part of his payment. This small mention is noteworthy because many tacks, fused in masses, unused, and apparently spilled from containers, have been found on the St. Johns site (Fig. 16.9).

Las Alas also noted that he exchanged “stores, and lead, and wood.” The term “stores” is not clear – perhaps it means foodstuffs – and what sort of wood is also not known, but stored lead, in the form of a roll of sheet-lead that could be unrolled, cut, and dispensed as needed, is found in the St. Johns artefacts. It seems likely that this sort of stored-supply lead is what was exchanged by Las Alas as part of his payment for the lantern.

From other testimony, it is seen that Las Alas had money at his disposal to pay crew for extra services. This cash was apparently separate from the treasure carried on board the galleons, as no accounts indicate coins were carried as cargo. It was said, “...the esteemed general Esteban de Las Alas gave and paid to each person...that went ten *ducados* each...because they went in the caravel from La Terceira, and for these said *maravedis* he gave receipt of payment in the presence of me, Luis Luzardo, scribe of the ship Capitana” (Luzardo, 1564). The payment to these men was accounted for in *ducados* (ducats) but appears to have been paid in *maravedis*. This would not be unusual, as high-value gold ducat coins were rarely circulated, instead silver *real* coins and copper *maravedi* coins were more frequently used. Two copper two-*maravedis* coins and small-denomination silver coins have been found scattered amongst the wreckage on the St. Johns ship, apparently “pocket change” and not part of any packed cargo.

Las Alas’ correspondence to King Philip offers another view of the *Santa Clara*, by noting what was removed from the ship before it was abandoned. Las Alas said succinctly, “And so we saved the Capitana before we were all lost in the manner of the ship that we were leaving there [*Santa Clara*] without taking anything more from it than the **silver** and the **gold** and the **people...**” (Las Alas, 1564). Knowing what materials are not supposed to be on the ship is just as significant as knowing those that are. His statement makes clear that at the shipwreck site of the *Santa Clara* there should be no cargo of silver or gold, and no evidence that people perished there.

King Philip gave an equally significant account regarding the *Santa Clara* and what was left on it, when he wrote to the Casa, “they abandoned **the said galleon**, and **the artillery, munitions, and equipment** that it had.” (Philip II, 1565c). With this statement, it is apparent that the ship’s hull, guns, shot, weaponry, and other rigging, gear, and tools were left behind. The shipwreck site of *Santa Clara* should reflect this and consist of an assemblage of structural remains, artillery and other weaponry, shot, and a wide variety of ship’s equipment.

| Object in Historical Record | Present on St. Johns Site? |
|------------------------------------|-----------------------------------|
| Caulked canitas | Yes – as caulking iron? |
| Topmasts | No |
| Yards | No |
| Masts | Yes, as shroud chains |
| Rigging | Yes |
| Tackle-pendants/Swifters | No |
| Mizzen mast | No |
| Ratlines | Yes, as shroud chains |
| Shrouds | Yes, as shroud chains |
| Artillery | Yes |
| Munitions | Yes |
| Powder | Yes |
| Harquebuses | Yes |
| Versos | Yes |
| Shallop | No |
| Biscuit | No |
| Cassava | No |
| Maize | No |
| Meat | Yes |
| Botijas | Yes |
| Shot | Yes |
| Lantern | Yes, but only as pan lamp |
| Silver bars | Possibly, in 1981 salvage |
| Gold | No |
| Plata corriente | Yes |
| Ducados | No |
| Maravedis | Yes |
| Shields | No, but body armour is |
| Pikes | Yes |
| Crossbows | Yes |
| Mackerels | No. |
| Arroba of oil | Yes, as botijas |
| Flour | No. |
| Candles | Yes, as wick-trimmers |
| Worked white wax | No. |
| Holanda cloth | Yes, as cloth seals |
| Lead | Yes |
| Wood | No. |
| Mengala cloth | Yes, as seals |
| Tranzaderas ribbons | No |
| Tacks | Yes |

Table 16.3. Goods mentioned in 1563-1564 fleet documents and whether they are present on the wreck.

Despite what is a somewhat random accounting of material goods associated with the 1564 *Tierra Firme* flota, there is still a strong correlation with the materials discovered on the St. Johns shipwreck. In fact, many of the listed items that are not found on the shipwreck are from categories or areas of the wreck that were not preserved, especially the masts and ropes, and materials that would not be expected to preserve in the marine environment, such as flour, biscuit, and wax. Even in their absence, some of these items are known to have been present because of more durable equipment associated with them – i.e. shroud chains indicate masts, shrouds, and ratlines; wick trimmers indicate candles. With those highly perishable items excluded, the correlation between the historical and archaeological records is nearly direct (Table 16.3). Though this correlation is not definitive, it does support the idea that the St. Johns ship is the *Santa Clara*. And the absence of human remains or a large number of personal goods, valuables, or clothing, indicates that no one perished at the site. The lack of a significant treasure on the shipwreck corresponds with the recovery of *Santa Clara's* precious cargo.

By extracting historical evidence for specific material goods associated with the 1563-1564 *Tierra Firme* fleet, and then comparing the data to the archaeological remains of the St. Johns wreck, a strong correlation between the two is seen. With the exception of foodstuffs and other organic components, almost all the objects listed in the documents appear in the collection of recovered artefacts, or are directly represented in some other form. The items left behind when *Santa Clara* was abandoned, as well as those immediately saved from the stricken ship, all match the characteristics of the St. Johns wreck, which has a wooden hull with a large collection of artillery, munitions and shipboard equipment, but no sizeable treasure and no evidence people perished when it sank.

Other factors tie the *Santa Clara* and St. Johns site even closer. As a group, the items recovered from the St. Johns wreck fall within a 1555 to 1570 time-frame, and *Santa Clara* sank in 1564. The St. Johns ship was somewhere between 250 and 400 tons; *Santa Clara* was 300 tons. The St. Johns wreck has linkages to South America; *Santa Clara* sailed to Colombia and Panama. And when the evidence for where *Santa Clara* was lost is included – at “Mimere,” along the Little Bahama Bank on the north-eastern side of the Bahama Channel – no other Spanish-colonial shipwreck of the time matches so closely. The St. Johns shipwreck can be none other than *Santa Clara*.

CHAPTER 17: AN ACCOUNT OF THE 1563-1564 *TIERRA FIRME* FLEET

This writer's investigation, transcription, and translation of Spanish archival materials, and other contemporary writings, has revealed a detailed history of the purposes, preparations, and travels of the 1563-1564 *Tierra Firme* fleet, as well as the loss of *Santa Clara* on the reef at *Mimere*. This research uncovers many of the particular realities in which the ships operated: who was using them, what they were doing, and the political, social, and commercial structures that helped to shape their travels.

On July 7, 1563, King Philip II of Spain sent notice to the officials of the *Casa de Contratación* that three galleons owned by General Pedro Menéndez de Avilés were to sail for *Tierra Firme* "for things that touch upon our service" (Philip II, 1563c). The three ships comprising the small fleet were the *San Pelayo*, a 900-ton galleon sailing as *capitana*, or lead ship; the 300-ton galleon/*nao Santa Clara* as *almiranta*, or rear-guard vessel; and the *Magdalena*, a 250-ton *nao* (Chaunu & Chaunu, 1955b:38; Lyon, 1976:36). The fleet, referred to as the "three galleons" in many of the documents, was specifically organized to carry the licentiate Lope García de Castro, who had been named the new interim viceroy of Peru and President of the *Audiencia Real*, or royal Audience, at Lima, positions that made him the head of Spanish government in South America. Menéndez was obligated to have the ships ready to carry García de Castro in September or face a penalty of 40,000 *ducados*. The *Casa's* officials were encouraged by King Philip to work with Menéndez to see that the ships were sent without delay. The King's directive also outlined some other issues to be tended to in the American colonies. He urged that a ship of Juan de Ojeda should travel with the three galleons and go to Santo Domingo to pick up the *avería* (the tax levied on transatlantic cargoes to support the fleets and their defence) that was due. Another ship was to go to San Juan de Puerto Rico with provisions and other goods, as the governor of that place had written and said their needs there were great. Also, the King wanted another fleet organized for January, as there were merchants who were unable to load cargoes for the Indies before the September deadline.

The owner of the three galleons, Pedro Menéndez, loomed large in the maritime world of the sixteenth century (Fig. 17.1). Born in 1519, he was a native of the town of Avilés in the region of Asturias on Spain's north coast. He was a master mariner and a leading figure of the Indies fleets. In 1556, Menéndez wrote a treatise outlining a regular system for Indies fleets in which two annual convoys sailed with armed galleons. Based on his practical experience, Menéndez called for one fleet to sail to New Spain in the early part of the year, and another to *Tierra Firme* in August or September. Menéndez' system, largely put into practice in the early 1560's, was formalized by law in October of 1564, and

became standard practice for Spanish ships for the next two centuries (Philip II, 1564c; Caballos, 2006). Pedro Menéndez was a long-time, trusted confidant of King Philip, which created problems for him with other sections of the Spanish government, especially the *Casa de Contratación*, the governmental body that oversaw trade with the Indies (Manucy, 1992; Lyon, 1976:36). Much of the tension was the result of King Philip having taken the power from the *Casa* for naming the captains-general of the Indies fleet for himself, and Pedro Menéndez was the beneficiary of this policy. Because of this apparent favouritism, Menéndez earned the scorn of the *Casa* and was watched closely by its officials for any infractions in his maritime affairs. In June of 1563, after returning from the Indies, he and his brother Bartolome were accused by the *Casa* of smuggling, and they were arrested and held prisoner in the *ataranzas*, or arsenal, of Seville. Pedro Menéndez complained bitterly, but vainly, to the King, whose power was limited in the matter. Still, despite his status as prisoner, Menéndez was a trusted figure in nautical matters and was the person King Philip went to in the important issue of making sure the licentiate Castro was delivered to his to his post.

Other ships were appended to the small fleet of three galleons, primarily for the protection provided under the guns of the larger ships and for the ability of a greater number of ships to rescue passengers and cargo in times of trouble. Some 19 days after giving his initial consent to Menéndez, the King granted permission for a ship of Juan de Bustillo to sail with the fleet for Honduras (Philip II, 1563d). Bustillo's ship was to carry the Licentiate Francisco Briceño, who had been appointed president of the *Audiencia* at Guatemala, as well as a group of religious figures traveling with him.

By July 27, the organization of the three ships was well underway; Menéndez wrote to the King, "I have three galleons in preparation, and they are scheduled to begin loading within ten days. They are out now and are to sail by the September 15 or 20, as Your Majesty asked of me. They will be very well-appointed and well-equipped" (Menéndez de Avilés, 1563b). In the same letter, Menéndez, resentful of being held prisoner, also expressed considerable bitterness towards officials of the *Casa de Contratación* about the treatment he and his brother Bartolome had received at their hands. Bartolome had been near death with fevers, and Pedro had little doubt as to why: "I think the greatest cause of his illness came from anger and sorrow that he received from knowing that the official judges of the Casa sent two constables with shackles and chains to the ship where he was to be carried as a prisoner of the Contratación, as if he were a thief," he complained.

On August 11, a sympathetic King Philip directed the officials of the *Casa* to permit Menéndez to leave his quarters and travel to Cádiz, so he could personally oversee the preparation of the three galleons, as

the ships were slow in getting ready, and he needed to be there (Philip II, 1563e). The ships were at Sanlúcar and waiting for favourable wind and tides to go to Cádiz. In a second letter of that same date, the King noted that two of the galleons (probably *Santa Clara* and *Magdalena*) were at the dock. He also



Figure 17.1. Pedro Menéndez de Avilés (Francisco de Paula Martí, 1791. Library of Congress, Washington, DC).

reaffirmed that ships for Santo Domingo and San Juan were permitted to travel across the Atlantic with the galleons, and they could then part ways with the fleet at Dominica. Other ships for those two Caribbean ports, plus one for *Nueva España*, and another for Honduras, were also permitted to sail (Philip II, 1563f).

Menéndez, still incarcerated, wrote to Philip on August 21 that his “new” galleon (*San Pelayo*) was at “Las Ahorcadas,” a station for larger ships some eight leagues below Seville on the Guadalquivir River, and it would be brought down-river to be loaded in time to meet the September obligation (Menéndez de Avilés, 1563c). He felt that with good tides (*aguas vivas*) all the ships could be brought to Cádiz in 3 or 4 days. Menéndez stressed that moving the galleons would be difficult, expensive, and risky, and he openly wished he could travel with the fleet to Cádiz, writing “for there is no person going in it who understands it like I do, nor for whom it affects so much.” Menéndez noted that only his imprisonment was stopping him from being there. He begged the King to let him temporarily leave his confinement and be present for the departure of the ships from Sanlúcar; as he pointed out, he had already put up bonds and was willing to pay more if necessary.



Figure 17.2. Cádiz. (Georg Braun & Frans Hogenberg, *Civitates Orbis Terrarum*, 1572 Universitätsbibliothek Heidelberg).

On August 26, officials of the Council of the Indies wrote to remind the *Casa* that Menéndez had an obligation to have the three galleons ready by the September 20, and that he was in danger of not meeting it, because of his incarceration. They wondered why he was being impeded in preparing his three galleons and asked that the *Casa* provide justification for holding Menéndez (Sarmiento, et al, 1563a). On September 2, the Council wrote again, and said of Menéndez’ imprisonment in the *ataranzas*, “his said confinement, writ large, was irritating and inconvenient for his ability to complete what is obligated and to have ready the three galleons that have to go to Nombre de Dios and in which the Licentiate Castro of this council is going.” The Council asked that security bonds be calculated so that

Menéndez could be released to oversee the preparation of the galleons for departure (Sarmiento et al, 1563b).

The *Casa de Contratación* was apparently in no hurry to allow Menéndez to visit his ships, as he was still being held in the *ataranzas* in mid-September. From his confinement, he wrote another letter to King Philip noting that he had been held for well over a month and that the officials needed to make a decision regarding his fate (Menéndez de Avilés, 1563d). Menéndez also expressed his apprehension about the looming 40,000 *ducado* penalty he faced if he did not have the three galleons ready to sail by September 20.

On September 24, Menéndez again wrote the King; this time he had been released and had seen the galleons first-hand (Menéndez de Avilés, 1563e). He noted that on the 15th of the month the ships had been at Sanlúcar ready for Cádiz, loaded with their cargo. Menéndez described that though the three galleons could carry a combined load of 1500 tons, they were initially loaded with only 1300. The remaining 200 tons were put aboard on the 18th, after the pilots had given their approval. Menéndez said he had gone to the ships on September 20 and found only one of them was ready to go. He hoped that by the time his letter reached the King the three ships would at last be in Cádiz, ready for their final preparations.

On September 25, King Philip sent out two directives regarding the timely dispatch and return of the three galleons, one to the *Casa de La Contratación* (Philip II, 1563g), and one to the officials at Panama (Philip II, 1563h). In both, the King demanded that the ships return quickly to Spain, without obstruction or delay. To the officials at Panama, he said,

"...they [will] sail after they are loaded and they have been ballasted and are equipped to return to these kingdoms. And [if you are] wanting to make the register to carry the gold and silver and pearls and other things of ours and of individuals, do not give a register, or hinder them, saying that you await money from Peru or of other causes or reasons, because the ships that go without a fleet tend to be hindered, and if this is made with the said galleons, they would be in great danger and detriment because they would be eaten by shipworms, and the people of them would have a great cost that they would plead to me. You will command that, wanting the three said galleons to return to these kingdoms, they dissent [do not need] register, and let them return freely, without putting any impediment on their journey..."

Despite King Philip's demands for haste on a future return voyage, the galleons had only gone as far as Cádiz, and there they struggled to leave the dock. The licentiate Lope García de Castro arrived at Seville on September 27, where he learned the galleons were at last in Cádiz, but, he wrote to King Philip, "I do

not believe that I need to get ready to sail, since the officials told me the galleons are not fully appointed; they do not have in them certain works by the caulkers” (García de Castro, 1563a [1921]:1). Castro did note that Pedro Menéndez had promised a “well-appointed setting” would be given to him in short order. Castro expected he would be under sail for Peru by October 8 or 10. In a letter to the Council of the Indies and the *Casa de Contratación* on October 10, the King indicated that the fleet continued to be plagued by delays. “In the dispatch of the said licentiate Castro, you shall give all the possible haste, as it is commanded, because it matters much [to the] service of His Majesty that in his departure there is no delay...,” he wrote (Philip II, 1563i). The licentiate Castro left Seville on October 6 and arrived at Cádiz on October 9. A few days later, he wrote to King Philip that he expected the voyage to the Indies to be underway by the 15th of that month (García de Castro, 1563b [1921]:4).



Figure 17.3. Lope García de Castro. (Anonymous, ca. 1570, Museo Nacional de Arqueología, Antropología, e Historia del Perú, Lima).

At the same time that Castro was making his way to Cádiz, the final licenses for travel to the Indies were issued to the various passengers sailing on the three galleons (*Casa de Contratación*, 1563a). Among

those going on *San Pelayo* were not only Lope García de Castro, but his retinue of nineteen “servants,” many of whom were family members or business people hoping to use their connections to the new President to an advantage in Peru. Castro’s nephew, Alvaro Rodríguez de Mendaña (also known as Alvaro de Mendaña de Nehra) was among this group. In 1567, with the support of his uncle, Mendaña would find fame by leading the first of his two expeditions through the South Pacific, resulting in the discovery of many islands previously unknown to Europeans (Vazquez, 1994). Also sailing on *San Pelayo* was the licentiate Francisco Franco, one of Spain’s leading experts on contagious diseases (Franco, 1569).

Traveling on the smaller ship *Magdalena* was don Francisco Ynga Atabalipa, with four Indian servants and four Black slaves (Casa de Contratación, 1563b:15r). Don Francisco, also known as Tupac Ataucu, was the oldest son of the Inca Atahualpa, the late ruler of the great South American empire who had been killed some thirty years earlier by Francisco Pizarro at Cajamarca, Peru (Gangotena y Jijon, 1959; Soriano, 1978;). Gaspar de La Mota, a conquistador and prominent resident of the Guadalajara region of Mexico, and son and grandson of Francisco and Geronimo de La Mota, both compatriots of Hernan Cortez in the conquest of the Aztec empire, was also on *Magdalena* (Anguiano, 1992).

On the *Santa Clara*, the notary Pedro de Castañeda was traveling with his wife, their seven children, and a niece. He had also been given permission to transport three African slaves to South America (Casa de Contratación, 1563b, 11r). Castañeda had a long history with *Tierra Firme* and Peru. In 1535, Castañeda had sailed with Felipe Gutiérrez to conquer Veragua (Panama) for the descendants of Christopher Columbus (Casa de Contratación, 1535). The expedition failed miserably, and the survivors went to Peru to join forces with Pizarro (Anderson, 1914). There, Castañeda became an official notary for the government of Francisco Pizarro and a founding citizen of Lima (Clemence, 1936). He was returning to Peru to reprise his role as notary, this time in the city of La Plata.

Some passengers were simply assigned for travel “In any Vessel.” Among these people were the licentiate Hernando de Santillán, who was traveling to Peru as the first president of the newly-created Royal Audience of Quito. Santillán had a significant history with Peru from 1550 to 1568 (Szaszdi, 1966). Before his presidency at Quito, Santillán was a judge for the Royal Audiencia at Lima. There, he had been a champion for the rights of the Indians; an official who worked hard to diminish their exploitation by the Spaniards and successfully instituted policies to that effect. Unfortunately, Santillán tended towards an autocratic style of leadership that made him controversial and ultimately led to his removal from office.

Despite a full complement of passengers ready to begin their voyage, the delays were to continue. On October 10, the judge and factor Francisco Duarte of the *Casa de Contratación* led a party to the docks in Cádiz to inspect the three galleons and gauge their status. Pedro Menéndez met with the inspectors, assuring them that all was in order, but when they looked at the ships they saw a different story. The galleon *San Pelayo*, the inspectors found, was plainly unprepared for the voyage:

“[It was] not ready to be inspected nor to depart in pursuit of its voyage, because in the said ship they had not made carpentry work, and likewise were caulking of the canitas[?] about which is the principal work of the ship, and it is lacking the placement of the topmasts and major and minor yards, nor is the main mast set, nor the rigging darkened (tarred?), nor are the tackle-pendants (heavy lines to support cargo-loading) made with their equipment, nor the sails linked with the masts or yards, except the mizzen, nor are the ratlines made in the shrouds, nor has the accommodation where the said Señor President [Castro] is going been made olamarado [seaworthy?], and, likewise, the artillery and munitions are not put where they have to go, nor [is it] manned for sea with the mariners, and master, and pilot, who are needed, and other officials, who, according to that which His Majesty ordered, should be going on the voyage, and likewise it does not have in the said ship the provisions needed for the voyage, nor is the said ship put in order like it has to be for being able to be inspected and to leave in pursuit of its voyage as is wanted and costs” (Salinas, 1563).

The following day, the inspectors returned and saw much work – carpentry, caulking, and loading of the vessel – taking place and progressing steadily; they allowed the efforts to proceed unimpeded. On October 13, the loading of the vessels was complete. Also by then, the master and pilot of *San Pelayo* had arrived. There was disagreement with Menéndez about the ships’ preparedness and the necessity of cargo registers, but he swore that he would have everything ready before noon on October 14. When the time came, the inspectors from the Casa went to the galleons *Magdalena* and *Santa Clara*, where they were told by both masters that the ships were not ready for inspection. Duarte commenced the inspection on *San Pelayo*, and the others were given until the next day to comply (ibid.).

For his part, in a lengthy defence of his services to the Crown, Pedro Menéndez outlined to King Philip that when the inspectors saw the galleons, he felt they could only have been impressed by how well he had outfitted them: *“That the officials of the Casa de la Contratación inspected the three galleons of the said general Pedro Menéndez, in which goes the licentiate Castro; in the two of them he added more artillery, men, and munitions; being his now, [but] which belonged to other owners when they were added, and the other third galleon that the said general made new [San Pelayo]; he added much more*

artillery, people, and munitions, of which the greater has never been seen in this navigation to the larger part of ships, as counted by those inspectors” (Menéndez de Avilés, 1564a).

On October 22, the officials of the *Casa de Contratación* officially declared Esteban de Las Alas Captain-General of the small *Tierra Firme* fleet, saying “Being confident in your integrity and experience in the navigation of it, we provide and command that you will be captain general of all the said ships that go in consort with it, and as such, lift the banner of *Capitana* in the said galleon [*San Pelayo*] and provide and order that all the said ships, as the said *Capitana*, continue without setback or loss...” (Gutierrez, 1563). With Menéndez back in prison and unable to command the fleet himself, Las Alas was a natural second choice. He was and an experienced sailor and an old and trusted friend of Menéndez from his hometown of Avilés, and the two had worked together in various fleets since 1553 (Blanco, 1992).

One last vessel was allowed to sail with the fleet on November 12, when the Sevillian slave-trader Rodrigo Baço was given permission to send his ship *Nuestra Señora de Natividad*, bound for Mexico with 300 slaves, in company with the three galleons (Sarmiento, et al, 1563c). He was too late, though, as two weeks later Baço asked for permission for his ship to leave alone in pursuit of the three ships, as he had found they had already departed (Council of the Indies, 1563).

The three galleons and four other ships had left Cádiz on November 16, but they soon ran into trouble and their voyage was ultimately short-lived (García de Castro, 1563c). In a letter to the King, García de Castro explained that three days out from Cape St. Vincent at south-western Portugal, a storm struck, and it lasted for two days. In the *Golfo de Yeguas* (the waters between Portugal and the Canary Islands) the storm abated, but it left at least one ship missing. At twenty leagues from the island of Lanzarote, another storm struck, which left Castro’s ship, *San Pelayo*, bare-masted and faltering. This second storm lasted thirty hours. *San Pelayo*, along with six other ships, made it to San Andres at Tenerife, only to be struck again by bad weather; this time it was a storm lasting twenty-four hours. After leaving San Andres, the ships had one day of calm before being hit yet again. “This time,” wrote Castro, “God gave us another storm, the likes of which had never been seen before, according to what the mariners say” (ibid.). The ships were tossed nearly to the point of swamping, and the topmasts had to be cut down to increase stability. The storm sent the ship’s boat with three sailors over the stern of *San Pelayo*; the boat had to be cut loose and the men drowned. The ships in the fleet all lit lanterns to stay in contact, but the *San Pelayo* was separated from the others, except two - a vessel that had been bound for Honduras and a small *patache*. The *San Pelayo* had been blown for over 100 leagues by the storm and had to struggle against the wind to return to Cádiz. With much of the canvas gone, the crew steered by using wind

caught in the prow of the ship. As they approached Cape St. Vincent, yet another storm struck. García de Castro wrote of the continued misfortune, "...if it had lasted, and the wind blown stronger, it could have been the end. God was served in that it did not last for more than six hours." The small group of weather-beaten ships arrived at Cádiz on December 6, but they had difficulty entering the bay because of shoals at the entrance. Finding their way slowly, rowing and measuring the water depth with a sounding lead, the ships finally managed to enter the port. They found the *Magdalena*, with the licentiate Hernando de Santillán on board, was already there, battered but safe, but the other ships had not yet arrived. Lanterns were erected on shore to signal and guide those yet to arrive. After news of the disaster reached the offices of King Philip, the *Casa de La Contratación* was urged to move quickly to repair the damaged ships. "Yielding to His Divine Majesty bringing good, you will foresee that these ships that are coming, they are repaired with brevity, and to provide what is necessary so that when time is ready for it, they are able to return to their voyage" (Gomez, et al, 1563).

Those on board the storm-tossed ships suffered significant personal losses. The licentiate Briceño asked the crown for support because he had to throw all of his clothes into the sea during the storm, apparently in a desperate attempt to lighten the ship and keeping it afloat (Officials of the Council of the Indies, 1563). Because the *Magdalena* had been filling with water and was in danger of sinking, the licentiate Hernando Santillán had also found "...it was necessary to throw his clothes overboard, because it would be reckless not to do it" (Sarmiento, et al, 1564).

When Pedro Menéndez received word of the disaster, he put the blame for it, and his resulting financial hardship, squarely on the shoulders of the officials of the *Casa*, because they had held him in custody for too long and thus delayed the departure of the galleons. He wrote to King Philip, "*...if I had not been prisoner, my three galleons would be in the Indies and the licentiate Castro in those provinces, and Your Majesty would have been appropriately served in that he had travelled with all brevity to those provinces. Because I was not in Cádiz when the galleons left from that bay, they were stopped from departing when they first had good weather, and sailed. And from [their] having arrived blown by the wind and wrecked, my loss, costs, and damages have been large; and they should have earned a quantity of freight charges; and to restore them to being equipped as they should be, I need much money*" (Menéndez de Avilés, 1564b).

By early February of 1564, there were signs that the galleons were being successfully repaired and preparing to sail once again. On February 3, a slave trader named Vincencio Garrulo, bound to Honduras, was given permission to sail his ship loaded with 200 slaves in consort with the three galleons

(Philip II, 1564a). On February 5, Hernando de Santillán, because he was uncomfortable with what he saw as poor seaworthiness of the *Magdalena*, was granted permission to transfer to *San Pelayo* with all his goods and servants (Sarmiento, et al, 1564a).

Additional passengers were added to the ships' rosters throughout the earlier part of 1564 (*Casa de Contratación*, 1564a). Among them was Baltasar Mendez de Galvez, a conquistador who had first gone to Peru in 1535. He had spent sixteen years participating in various conquest expeditions throughout South America and as a loyalist soldier against Gonzalo Pizarro's breakaway government in Peru's post-conquest civil wars. Mendez de Galvez was returning to Peru to live out his remaining years (Medina, 1897). A true progeny of the Peruvian conquest, Martin de Ampuero, the *mestizo* son of the Inca princess doña Ines Impani (born Quispe Sisa) and the Spanish conquistador Francisco de Ampuero, sailed on board the *Magdalena*. Martin de Ampuero's half-sister, Francisca Pizarro (daughter of the conquistador Francisco Pizarro), was married to her uncle Hernando Pizarro (Hemming, 1970; Manarelli, 2007). Another *Magdalena* passenger, Antonio de Figueroa, also had with close ties to the conquistadors. Figueroa travelled as personal representative for the aforementioned Hernando and Francisca Pizarro, with the power to manage their assets in Peru (Gabai, 1997). Figueroa's brother had been one of Pizarro's partners in the South American conquest, and had later travelled to Chile with Diego Almagro in a failed attempt to take that land (Ojeda, 1908).

In the later part of March of 1564, Pedro de Meneses, canon of the cathedral at San Juan, Puerto Rico, was granted permission after a year and a half wait to send two altarpieces, organs, and a bell, among other things, for his church in an unnamed ship accompanying the three *Tierra Firme* galleons (Vazquez, et al, 1564a). In April, a dispute arose between Luis de Alvarez of Seville, and Salvador Garrido, and it sheds a bit of light on the business of another, unnamed vessel accompanying the fleet. Alvarez had consigned two slaves to Garrido, and they were carried on Garrido's ship, which was sailing with the three galleons. There was a question regarding the ownership and proper registration of the slaves, and the *Casa de la Contratación* urged the Council of the Indies to look into the matter and set things straight (Vazquez, et al, 1564b).

The three galleons finally left Cádiz again sometime in March, evidenced by Esteban de Las Alas' later testimony, where he said, "So as to leave with the first [good] weather, they left in March of the following year of sixty-four, in all of which the said Captain Esteban de Las Alas had much work for it [and] much diligence and application" (Las Alas, 1571a). Nothing more is recorded about the fleet's departure. But in a letter written to King Philip by the licentiate Castro at Cartagena on May 20, 1564, he

detailed aspects of the Atlantic crossing and arrival at *Tierra Firme* (García de Castro, 1564a). According to García de Castro, the ships had arrived without incident at Gomera in the Canary Islands and left from there on Easter morning (April 2) to cross the Atlantic. The wind was strong and the seas were rough when they left. The weather became so bad that of the four ships that departed, they were quickly separated into two groups. García de Castro's ship *San Pelayo* was accompanied by the ship carrying the licentiate Briceño to Guatemala, and they could not see *Santa Clara* and *Magdalena*. The bad weather continued until mid-ocean, when the ships had a six-day lull. During the calm, everyone worked to restore the ships to order. The bad weather had damaged many of their supplies, though, and they were woefully short of water. On their arrival at Dominica, in the Lesser Antilles, the ship carrying the licentiate Briceño parted company for San Juan. The *San Pelayo* sent a shallop mounting two wrought-iron swivel cannon (*versos*) to shore at Dominica with twelve harquebusiers. Despite the firepower, García de Castro noted, "The Indians were so cunning, they did not let them take the water..." By the time *San Pelayo* arrived at Santa Marta, on the north coast of South America, they carried less than ten *azumbres* (20 litres) of water. Fortunately, a *patache* (small ship) was quick to greet them there and offered refreshment.

García de Castro made many observations and recommendations about infrastructure and politics of the area, and he reported them to King Philip; his letter gives a good sense of the world in which the three galleons operated. García de Castro was eager for the king to know that it would be more efficient for ships offloading cargo for the interior region of *Nuevo Reino* to do so at Santa Marta, as the distance from there to the inland route of the Rio Grande was six leagues, versus thirty from the more-often used Cartagena. His thinking was that so many ships went to Cartagena the people there would not care about such a shift, and the added traffic would only benefit Santa Marta. García de Castro also shared the news that the Bishop of *Tierra Firme* and Luis de Guzman, the Governor of Panama, had died.

After a two-day stay at Santa Marta, the ships left for a short, two-day voyage to Cartagena. There, García de Castro was greeted with the news that Diego López de Zúñiga, the *Conde de Nieva* and the fourth viceroy of Peru, and the man García de Castro was to replace, had died on February 19. A few days later, word came from the *Conde's* widow that he had died of an apoplexy; Castro apprehended and interrogated the messenger and then sent his findings in confidence to the *Casa de la Contratación*. Additionally, Castro said the treasurer of Lima told him "something that I think concerns the justice of Your Majesty and the assessment of the Count. I am taking what he said as a sealed dispatch and

sending it for Your Majesty to see.” (There was a suspicion at the time that the Conde de Nieva had been having an affair with a married woman and was murdered by her husband (Bringas, 2001).)



Figure 17.4. Drake in Cartagena. (Baptista Boazio, 1589, Kislak Collection, Library of Congress, Washington, DC).

García de Castro had been asked by King Philip to report on the mining situation at the Rio Magdalena. He found the residents of Santa Marta were unable to profit from the mines, as they were outside of their jurisdiction. The residents of Cartagena felt the mines would not be profitable, but, as García de Castro implied, this might be because of a lack of effort, since they were making much more money by selling goods to visiting ships. To see an improvement in output, he encouraged the King to open the mines to all.

García de Castro also reported on the situations of various groups of Native Americans in the region. He found that governor Manjarres of Santa Marta had made peace with with “all the Indians that are here, from the Rio de la Hacha, and from the Tairona valley, and the Sierra de la Bonda, and I say if it were not for his illness, he would have already brought peace to those of the Sierra Nevadas, of which it is

reported to have much gold and silver..." He also noted in his report, "There I understood how those of the Rio de la Hacha still have the Indians as slaves in the pearl fishery, and they are thrown into chains at night." A treasurer named Saavedra, after having had Indian labourers removed from his ranch by a judge because he was mistreating them, was again employing Natives at the minimum rate of six *castellanos* a year, "against their will or not." Also, García de Castro was shocked when he visited the monastery of Santo Domingo: "I saw that inside of it, not far from the chambers of the friars, live certain female Indians that serve them, and none are old women."

From Cartagena, the three galleons left for the port of Nombre de Dios on the Isthmus of Panama; they reached there on the first of June (Las Alas, 1564). After having spent about two weeks in Nombre de Dios, the licentiate Castro wrote another long letter to King Philip, offering his observations about what he had seen and how improvements could be made there (García de Castro, 1564b [1921]:5-7). García de Castro began his second letter by reiterating his strong support for having ships from Spain trading with *Nuevo Reino* travel to Santa Marta instead of Cartagena. As he saw it, Santa Marta was much closer to the Rio Grande, the town itself was well-situated for growth, and the port was good and easily defensible. He figured Cartagena was already a busy and profitable port with a growing population and would continue to be so, no matter what.

As for Nombre de Dios, García de Castro said, "I've seen this town and it appears to me that it is more substantial and better ground than that of Santa Marta and Cartagena. They say that it is unhealthy and that this is caused by two things: the first is that it is all full of mountains up next to the houses, and the other a swamp that is next to the houses of the town." Nombre de Dios was also the Caribbean depot for South American treasure: "This is a town where there is a very large trade, because for up to now, I have been in it for twelve days, [and] there have entered in [it] bars of silver and gold worth more than one million [*pesos*]..." wrote García de Castro. He also noted that all the residents of Nombre de Dios were merchants who had no desire for anything but business; the town was neglected and in need of improvement. He felt the residents there were well-able to afford being taxed to pay for expansion and improvements. García de Castro proposed a public works scheme to expand Nombre de Dios. "They took it a little heavily," García de Castro said after presenting his idea to the residents, but "they all concluded that it was very necessary for the increase of the town." A deal was reached in which the Crown would provide a two-year loan of seven thousand *pesos* to buy fifty slaves to quarry rock and clear ground for expansion. The city of Nombre de Dios was also charging a freight fee of 1 *tomín* per ton to collect 4000 ducats for the construction of a cargo dock. García de Castro said of the planned

dock, “Without a doubt it is very necessary because one of the causes by where many sailors are sickened and die in this town is because of the great heat, and to unload the ships, they come to shore with the ships’ boats, sweating, and thus have to jump into the water; by bringing what they carry in the boat, they are not able to escape being sick.”

While anchored at Nombre de Dios, *Santa Clara* and *San Pelayo* had a minor collision; they crossed in a gust of wind, which caused the *Santa Clara*’s bowsprit to tear away the *San Pelayo*’s lantern. Also, Esteban de Las Alas had to file complaints with the officials there because of the extra time it took to load the galleons, including having to work on a Sunday at an additional fee. Plus, he was required to find lodging on shore for himself and his assistants, so they could negotiate the loading of the ships (Las Alas, 1571b). Despite the expenses incurred there, Las Alas did note that business was good for them: “The merchandise that went to Nombre de Dios was valued well, say those that went with the fleet: All sold, one hundred per cent. The *botija* of wine was worth two *pesos* and two *tomines*, assayed” (Las Alas, 1564).

Also, while at Nombre de Dios, the ships discharged passengers, including the licentiate Lope García de Castro, Hernando de Santillán, and Pedro de Castañeda, and from there they headed further afield. Castro was able to write one last letter to King Philip from Panama City and have it still return to Spain with the three ships (García de Castro, 1564c [1921]:8-13). In it, García de Castro described how he met with the governor of Veragua, Alonso Vasquez, and the explorer Juan Vazquez de Coronado, who was there fresh from his successful conquest of Costa Rica. There was a dispute between the two men regarding border claims, and García de Castro ordered there be no action by either party until the *Audiencia* outlined their decision in the matter; both men agreed to this. García de Castro also reported observations about certain muleteers who carried loads of silver and gold from Panama City to Nombre de Dios, giving some insight into the overland delivery of Peruvian treasure from the Pacific to the Caribbean. Of one shipment he noted there were two loads of gold each valued at 20,000 *pesos*, and approximately thirty loads of silver, each load valued at 1,500 *pesos*. This was “without the suspicion of one muleteer about certain sacks of flour, who said it was apparently more than flour, because it weighed a lot.” García de Castro also noted that everything was very expensive in the New World. As he described, “The land is so expensive for everything that there is, if not for cow or calf, which is valued in vain, and that no man is able to afford.” The expenses there were also apparently more than what was anticipated by the licentiate Santillán, who was forced to secure loans of three thousand *pesos* to continue his journey from Panama to Quito. With his letter, García de Castro included correspondence

from other officials and sent them all in a bundle to the three galleons that were soon to leave Nombre de Dios.



Figure 17.5. Nombre De Dios. (Anonymous, ca. 1590, *Histoire Naturelle des Indes*, Pierpont Morgan Library, New York).

A number of passengers boarded the ships at Nombre de Dios for the return voyage to Spain, with many of their names given in depositions of fellow travellers (Coronado, et al, 1565). Perhaps the most

notable passenger sailing with the three galleons was Juan Vazquez de Coronado, the aforementioned conquistador of Costa Rica, who was going to meet with King Philip to lay formal claim to his discoveries. Accompanying Coronado were Diego Caro de Mesa and Gregorio de Porrás, his associates in the Costa Rican venture. Another prominent passenger joining the galleons at Nombre de Dios was Diego Hernandez de Serpa, a resident of the Americas since the 1520's and explorer and conquistador of Eastern Venezuela and Guyana and a seeker of the mythical city of gold "El Dorado." At the same time that Hernandez de Serpa sailed to Spain, an epic poem was published about his distinguished career (Pacheco, Linares, and Stephan, 2006). Among the lesser-known passengers sailing from Nombre de Dios was the licentiate Antonio Cornejo and an unnamed family listed only as "a *mestizo* man, his wife, [and] an aunt."

The three ships left Nombre de Dios on the twelfth of August (Las Alas, 1564). Some thirty leagues from the port, the *Magdalena* was damaged in a storm and had to quit the voyage and return to port for repair (ibid; Philip II, 1565a). On the twenty-eighth of August, the diminished fleet of *San Pelayo* and *Santa Clara* arrived at Cartagena for a second time in their travels through the Americas. While in Cartagena, the *San Pelayo's* pilot, Juan Rodriguez, died. A new pilot for the galleon, Geronimo de Maya, was hired on September 15, for a fee of 150 pesos of silver in the form *plata corriente* (De Maya, 1564). On September 16, Las Alas had a new lantern made at Cartagena for *San Pelayo* to replace the one lost at Nombre de Dios. According to his account, he paid "*Holanda* [cloth] and stores and lead and workmanship" valued at 30 pesos for the new lantern (Las Alas, 1571b, f.3R). Pedro de Castro, the man who sold Las Alas the lantern, gave a more detailed account of what he charged. According to him, it cost "six *varas* of *Holanda*, and four *varas* of *Mengala* [Indian cloth], and forty-three *varas* of *tranzaderas* [plaited cloths or ribbons], and *tachuelas* [tacks]," again valued at 30 pesos (Castro, 1564). Pedro de Castro also noted that he sold one *quintal* and one *arroba* of white wax to Las Alas for the lantern. The wax was valued at 43 pesos.

A second group of Spain-bound passengers boarded the two ships while they were at Cartagena (Coronado, et al, 1565). Most prominent of this group was don Antonio Vaca de Castro, the son of the former viceroy of Peru, and who, in his own right, was an important figure and significant landholder in the areas around Lima. A retinue of servants travelled with Vaca de Castro. Also traveling from Peru were the wealthy citizens of Trujillo, Lorenzo de Zamudio and Pedro de Olmos. Lorenzo de Zamudio's father Francisco was an early Peruvian conquistador and a founder of the city of Trujillo. Zamudio, born in Trujillo in 1542, was also the owner of the *encomienda* of Tucume, which he had inherited from his

father (Quiñones, 1996). Pedro de Olmos was a widower and owner of the *repartimiento* (Native tribute-labour) at Saña, which he had inherited from his wife (López, 1563). Others boarding the ships at Cartagena were the licentiate and cleric Domingo López, who was traveling with his mistress, the cleric Julian García, and don Juan de Guzman.

Las Alas led his two-ship fleet out of Cartagena on September 20, bound for Havana. According to Las Alas “I left Cartagena on the twentieth of September to come to supply myself at Havana, because in Cartagena they had no biscuit, no cassava, no corn, nor meat. We sailed slowly, and the weather was contrary...” (Las Alas, 1564). After 3 or 4 days, the ships reached Havana, but the bad weather had not abated. Antonio Vaca de Castro, who had business at Havana, was eager to go there “because the licentiate Vaca de Castro, his father, had a thousand and some *pesos* there, which he had embargoed there in the time of his lawsuits and then gave approval to receive them there, and though he has sent directives from His Majesty, [he] has not been able to have them, and for this reason, this declarant [Antonio Vaca de Castro] was determined to come to the said Havana to finish that business [of] collecting the money placed there” (Vaca de Castro, 1565). Antonio Vaca de Castro also claimed that he was told by Las Alas that not only did they have to stop at Havana to re-supply the ships, but that they had to go there to re-set *San Pelayo’s* foremast, among “other things of necessity.” But this planned stop in Havana was not to be. Vaca de Castro said bluntly, “the weather was life-threatening.” Juan Vazquez de Coronado elaborated, “It was said in the ship there were some who wanted to winter there; others who did not, and that they could not take Havana, and [the idea] was reluctantly accepted for the ship to embark for the Bahama Channel.” As Vaca de Castro described, the ships were soon at the mercy of the Gulf Stream current, anyway. “[The ship] could not take the port of Havana as the mariners desired there be, and it was given a single tack to sea, and at dawn the ships found themselves over ones called *Los Roques* [islets at the north-eastern edge of Cay Sal Bank], which is at the mouth of the Bahama Channel, and could not go back...” He also noted that their uninterrupted course left them quite short of supplies, “for not having taken Havana, [there was] much work for refreshments in the gulf that it was distributed one *cuartilla* (pint) of water for each person...”

As the two galleons sailed northward through the Bahama Channel, their already bad luck diminished even further, and tragedy struck. Esteban de Las Alas described what happened to King Philip:

“On the sixth of October, at four in the morning, in the place they call El Mime, which is in the Bahama Channel, the waters drove us to the east side, and the galleon Santa Clara struck a shoal. And it fired a shot and lit a lantern, so we could see it from the Capitana. And we arrived to intervene and made a

sounding of eight brazas, or nine (40-45 feet). And we set the shallop out. And since it was dawning, the master of the Santa Clara came, having to see if we were touching [the bottom], and made certain requests of me. And then I was with the shallop, and from it, apparent to those who most understand, I ordered the gold and silver to be saved and that it be brought to the Capitana. Before that, [we were] engaged in saving the ship, which was tight and moving half-swimming, and thus we were delayed in removing the silver and gold until the evening, and, in the opinion of all, it was their obligation to abandon the ship. And so we saved the Capitana before we were all lost in the manner of the ship that we were leaving there, without taking anything more from it than the silver and the gold and the people” (Las Alas, 1564).

The *Santa Clara* carried a cargo of some 204,000 *pesos* of silver and gold on the account of the Crown, the Council of the Indies, and 195 individuals (*Casa de Contratación*, 1564b). This treasure was shipped in the form of 735 bars of silver, seventeen parcels of gold, and seventeen boxes of the crude form of silver known as *plata corriente* (Las Alas, 1564). According to Geronimo de Maya, pilot of *San Pelayo*, one parcel of *Santa Clara*'s silver nearly slipped by the rescuers: “They saved all the silver and gold that was carried in the said galleon (*Santa Clara*) and passed it to the galleon *San Pelayo*, and at the removal of the last box they removed as last it elided, and it was said that [there] remained a box from a chest, and [it was] full of bars, and having passed the said silver and people to the said galleon *San Pelayo*, they went seeking Terceira...” (De Maya, 1565). Francisco Romero, pilot of the *Santa Clara*, echoed this account: “...the said galleon touched on a shoal in the place that they call the Mimeres and that after the said galleon was stuck dry; this witness as pilot and the master and the rest of those that were coming made all the possible diligence to save the gold and the silver from the said galleon before it was bilged and lost, and while taking the gold and silver and before finished of removing it, heavy wind and seas bilged the said galleon and it flooded, and the silver that was of below was removed from under the water by submerging (*margullen*); it is that there was a final box where it came to the said silver which was one *braza* (1.5 meters) under the water, where they say that certain lost silver bars remained” (Romero, 1570:f.246-247).

Pedro Menéndez, probably reciting information given him by Las Alas, offered additional detail about the abandonment of *Santa Clara*. As he relayed the story to King Philip: “And even though it was very good and strong and had not broken or opened in any way at all, they abandoned the said galleon, and the artillery, munitions, and equipment that it had” (Philip II, 1565b).

Antonio Vaca de Castro described one last dilemma that occurred on the reef as they were leaving *Santa Clara* behind, “the galleon *San Pelayo* was in six or seven *brazas* of water [30-35 feet], and after having received the silver of His Majesty and passengers – to have this, they had stopped at great risk – and to leave from there, it was necessary to cast an anchor at forty *brazas* [200 feet] with a boat, and the sailors and passengers turned the capstan until the ship was in 10 to 13 *brazas* of water, and at the time they wanted to turn the ship to leave from there, the ship commenced to drag anchor, and because it is not wanted [for the *San Pelayo*] to drift onto the shoals, it was necessary to cut the [anchor] cable” (Vaca de Castro, 1565).

The *San Pelayo*, overcrowded with people and cargo, continued its voyage northward; everyone suffering through bad weather and a lack of supplies (Las Alas, 1564). In a reflection of the sort of trans-Atlantic traffic of the time, Las Alas noted that mid-ocean, “Some fifty leagues from Bermuda, we encountered a ship in bone [bad shape?], which was outfitted in Seville that Juan de Melemburque had loaded with leather, and in a storm he had parted ways from Pedro del Corro with another ship. And he did not wait for him because he was moving slowly, and for the shortage of food that was carried.” On November 13, *San Pelayo* reached Terceira in the Azores, the passengers “sick and in need of food,” according to Las Alas’ account.

At Terceira, “they arrived, emerged, and sprang to shore; the master with most all of the passengers and mariners, searching for supplies and a cable that was lost. That night, the cable tangled, and the ship dragged, and it was forced to make sail” according to *San Pelayo* pilot Geronimo de Maya (1565). The galleon waited offshore for a day with sails reefed; those onshore found a caravel to bring them out to *San Pelayo*, along with supplies, including five *pipas* [barrels] of water and a new anchor cable. At least three passengers, for reasons unknown, stayed at Terceira – Pedro de La Hoz, don Juan de Guzmán, and a friar of the order of San Francisco.

Because *San Pelayo* was so overcrowded, Esteban de Las Alas negotiated with the owner of the caravel to carry some of the passengers and crew to Spain. Las Alas arranged for each person to pay a fee of eighty *ducados* for the voyage (Las Alas, 1571a). Diego García, master of the damaged galleon *Magdalena* that was left behind in Panama, went on the caravel as pilot. To assist in the navigation and defence of the caravel, Las Alas placed nine crewmen on board the smaller vessel – Pedro García, Juan Flamenco, Cristóbal Pinto, Cristóbal García, Juan Barba, Juan Conde, Baltasar Álvarez, Gonzalo Núñez, and Gaspar González. He also placed the following armaments and provisions on board to supplement the additional people:

- Six pieces of artillery, with powder and munitions
- Six shields
- Six harquebuses
- Six crossbows
- Twelve pikes
- Three *quintales* [hundredweight] of biscuit
- Eight bottles of wine
- Five hundred mackerels
- One *arroba* of oil

The *San Pelayo*, along with the chartered caravel, then headed for Spain, but with difficulty. They started for Cape St. Vincent, then continued toward home, while “giving wide berth for the port of Sanlúcar de Barrameda, not knowing if the coast of Spain is presently secure from corsairs. Ordinarily before, [the corsairs] have usually waited for the ships that are coming from the Indies of His Majesty, so to rob them...” (Lusardo, 1564). It was also said that “The weather was in the strength of winter, for which reason there were fogs, obfuscations, and rain storms, which are all ordinary in the stated. In this weather there is great difficulty in being able to recognize the coast of Spain as the galleon passes, as [the ship] is very large and it is unable to near the land as it should” (ibid.). The caravel proved to be essential in this situation, as “it is able to go to reconnoitre the land, the bar, and other things that come for the ship, which was necessary because there was no *aviso* [advice] ship so the galleon *San Pelayo* can enter for good and secure navigation” (ibid.).

Apparently written with the hope of reaching the fleet in the Azores, King Philip sent a dispatch to Esteban de Las Alas on November 30, warning of the danger of corsairs. He said, “We have been informed that in the kingdom of England, nine ships are being armed with the intention of going to the Indies to rob and do what damage they can. And because you might be coming, take caution that you might encounter these corsairs and protect yourself from harm” (Philip II, 1564f).

On December 3, 1564, *San Pelayo* entered the harbour at Cádiz. The arrival was not without difficulty, though. “I came to this port under little power because we were without topsails. It became stuck, and the ship did not move anymore,” wrote Esteban de Las Alas (1564). The representative for *Casa de Contratación* at Cádiz, Antonio Abalia, said, “This galleon has run great risk and danger, because having been stationed yesterday at nine o’clock in the morning, three or four leagues from this city, and by not recognizing where they were, went toward the sand banks with a storm-front yesterday afternoon, where they were almost lost” (Abalia, 1564). The galleon was freed and once safely docked, the “closed and sealed” registers of the cargoes of *San Pelayo* and *Santa Clara* were dispatched immediately to the

King's offices, along with governmental correspondence from various officials in the Indies (ibid.; Casa de Contratación, 1564b). On December 10, King Philip requested that don Alvaro de Bazan use his coastal patrol ships to tow *San Pelayo* from Cádiz to Sanlúcar (Philip II, 1564f). But as of December 30, *San Pelayo* still had not moved and remained at Cádiz. King Philip ordered the silver and gold on board the galleon to be brought overland to the *Casa de Contratación* in Seville (Philip II, 1564g).

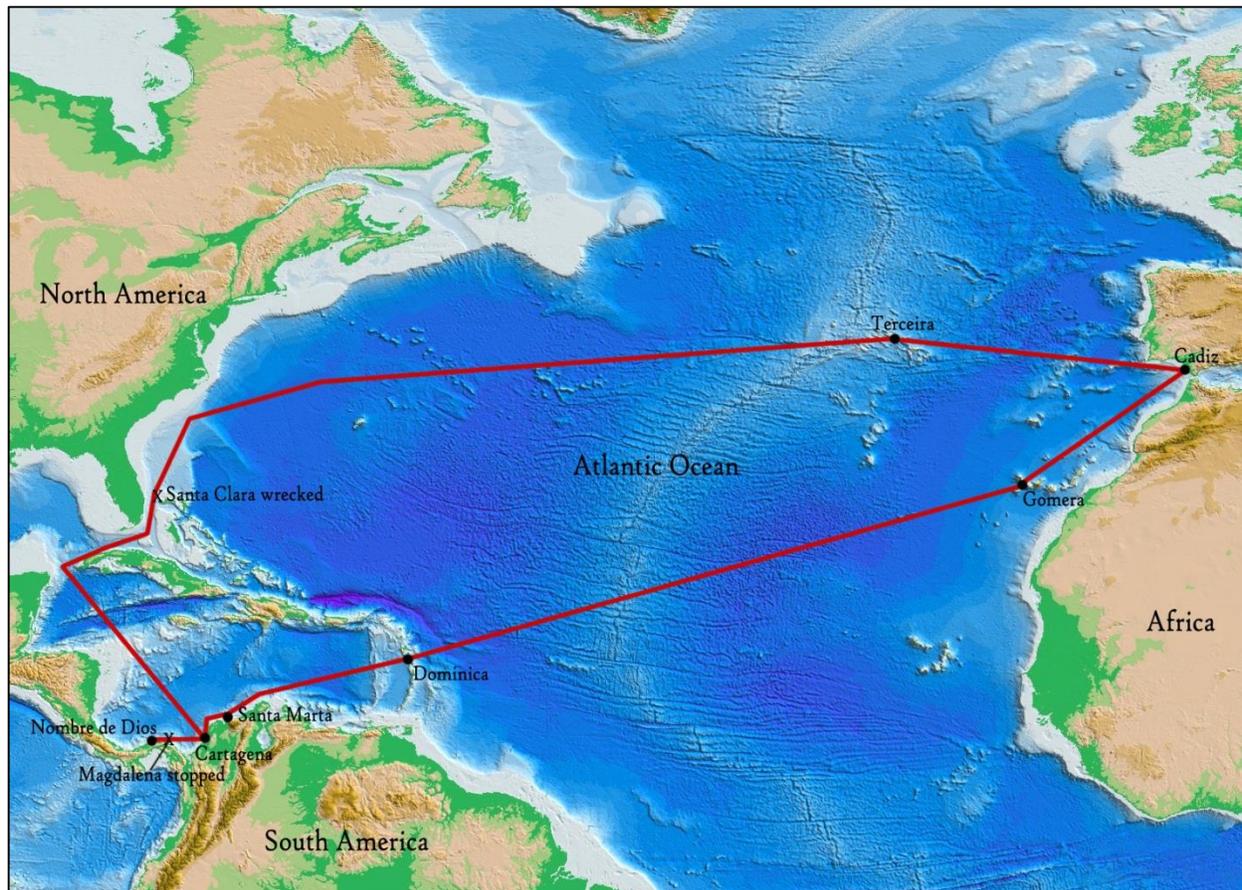


Figure 17.6. The reconstructed route of the 1564 *Tierra Firme* fleet. (Base Image NOAA).

There is no direct account found of the treasure making its arrival in Seville, but documents indicate that it did. By January 30, 1565, King Philip was corresponding with the treasurer of the *Casa de Contratación* about a suspicion that Antonio Vaca de Castro and others had brought unregistered silver and gold from the Indies to Spain (Philip II, 1565a). On March 6, King Philip encouraged the *Casa de Contratación* to use the *avería* taxes collected from the *San Pelayo* be used to help fund the ships of don Alvaro de Bazan (Philip II, 1565b). Pedro Menéndez had his eyes on the *avería*, too. He had written King Philip outlining the expenses he had suffered with the loss of *Santa Clara* and the delay of *Magdalena*. But he also had stressed the overall success of the fleet, with all of its treasure ultimately

reaching Spain in a timely manner to the benefit of both the Crown and private individuals. Menéndez asked for the *avería* to be used to refund his losses of “the galleon, equipment, artillery, and munitions, with the part lost and sunk, all of it, it will be divided from the *avería* and it might pay for all of it first...”; it was an idea that the King endorsed, and he encouraged the Casa to deliver justice for Menéndez (Philip II, 1565c).

There is no further mention of the *Santa Clara* by Menéndez, but he was probably too preoccupied to concern himself much further with the lost galleon. His legal woes with the Casa had come to an end in February of 1565, and credible accounts of French incursions into mainland La Florida were steadily reaching Spain. Free to face new challenges, Menéndez put together a plan for keeping the Bahama Channel safe for Spanish shipping by securing Florida, and he shared his ideas with King Philip (Lyon, 1976:41-43). Within weeks, on March 15, 1565, he signed an *asiento* with the Crown that allowed him to mount a fleet for the colonization of Florida (Menéndez & Vazquez, 1565). Then, after months of preparation, on June 27, 1565, Pedro Menéndez left from Cádiz in his great galleon *San Pelayo* on his way to lead the first successful European colonization endeavour of North America at St. Augustine, Florida.

Though it is impossible to know for sure, it is easy to imagine that *Santa Clara*, sitting abandoned on the reef, was seen by other, passing ships and approached. Perhaps, if possible, useful items were removed from the wreck. Certainly, at some point after its abandonment, the ship rolled onto its side down the backside of the reef. The upper, exposed side of the ship disintegrated over time, but the lower side was swallowed by the sand and held in quiet suspension for more than four centuries. *Santa Clara's* next chapter began when it was discovered by the men of St. Johns Expeditions.

CHAPTER 18: CONCLUSIONS AND FUTURE RESEARCH

The questions that were asked at the outset of the research into the St. Johns wreck can now be answered. The wreck is the 300-ton Spanish *nao* or *galeón Santa Clara* that wrecked on October 6, 1564, during a return voyage to Spain in the *Carrera de Indias* circuit. *Santa Clara* was part of a small fleet of three ships, all owned by the famed mariner Pedro Menéndez de Avilés, and these ships had transported government officials, other passengers, and a cargo of European goods to sell in the Colombian ports of Santa Marta and Cartagena, and Nombre de Dios in Panama. On the return voyage, the ships carried passengers who wished to go to Spain and a cargo of South American silver and gold.

The *Santa Clara's* wooden hull was of plank-on-frame (*carvel*) construction and was fastened with combinations of iron spikes, nails, bolts, and wooden dowels. The ship utilized a square-rig for its mainsail, and it mounted a battery of aging, wrought-iron, bombardeta-type guns and versos. These larger pieces of artillery were supplemented by a near-equal mix of matchlock harquebuses and crossbows, along with pole-arms and swords. When *Santa Clara* sank, the artillery was in storage below decks, and the smaller arms were stowed together in an area below the poop deck, indicators that the people on board felt secure and unthreatened at the time of the ship's loss. Pre-loaded powder charges for the bombardetas were stored lower and further aft, in the stern of the vessel, well away from the galley and its fire, which was situated towards the bow. The weaponry aboard the *Santa Clara* was not intended for use against Native peoples in the conquest of new lands, but, rather, for protection against French and English corsairs and pirates who were preying on Spanish ships returning from the Indies. In fact, *Santa Clara* only travelled to established, colonial ports, and its people had little to no hostile contact with Native Americans.

The evidence from *Santa Clara* shows that it had a strong, cross-pollinating effect in its transatlantic circuit. Certainly, people were the most significant travellers on the ship, and in the small Tierra Firme fleet of 1564, European colonists (some American-born), Native peoples, and African slaves travelled to and fro. Other living passengers – a pig, insects, and a baby caiman – were being carried outside of their native lands by the *Santa Clara*. And European grapes, hazelnuts, and olives had also made the Atlantic crossing on the ship. On the material side, Spanish wine, European cloth, horse shoes, and other goods were carried as items to supply the American colonies. Native American ceramics, along with possibly African-based types, were used in conjunction with European styles. Mexican and Peruvian silver was being used as money and treasure in the growing Spanish economic system.

Santa Clara wrecked when the winds and the currents carried the ship to the eastern edge of the Bahama Channel in the dark of night and the crew was caught unaware of the situation. The ship grounded on a shallow reef and could not be safely removed, so the people on board and the precious cargo of silver and gold were offloaded to the Capitana of the fleet, *San Pelayo*. *Santa Clara* and its equipment were left behind, abandoned and forgotten. Over time, the shipwreck decayed, but much of it was eventually covered over by sand and preserved. Its remains lay undisturbed for over four centuries, and the shipwreck only began to be resurrected when salvagers located the site in the 1980's and 1990's.

With the excavation and analysis of the St. Johns shipwreck, and its identification as *Santa Clara*, it is now an important and solidly-set building block for other, related research. By knowing the specific circumstances of the ship and its contents, the wreck has a much stronger standing for comparative analysis. *Santa Clara* can now be used to bolster broader understandings of how ships like it functioned, the nature of the *Carrera de Indias*, and the early Spanish colonial system. It can also be contrasted with other shipwreck sites known to have had different missions, such as exploration, colonization, fishing, or military assignments, or even sites and events from broader geographical or temporal ranges.

For example, what distinguishes the Emanuel Point shipwrecks – a mix of vessels outfitted at Mexico in 1559 for the establishment of a colony at Pensacola, Florida – from *Santa Clara*? Certainly, a substantial number of Aztec painted-redware ceramic pieces, copper crossbow points, and Aztec-style obsidian blades reflect the Mexican origins of the fleet's voyage. No hint of a treasure cargo is in line with ships that were not transporting wealth across the ocean. Instead, one ship carried mercury and scale weights, which suggests a hope of finding and processing ores in the land about to be colonized and the assaying of precious metals (Smith, et al, 1995: 119-120; Smith, et al, 1998: 156-157). Otherwise, the presence of large and small shot suggests the ships carried artillery and firearms, which, along with the crossbows, indicates a suite of weaponry consistent with many other shipwrecks of the era. Bones and seeds show the Emanuel Point ships were well-stocked with food, and, like on *Santa Clara*, cockroaches and beetles (and rats) were also taking advantage of this fare – evidence of a problem common to early Indies ships faced, no matter where they sailed. Interestingly, the Emanuel Point ships included many New World foods, unlike what is seen from *Santa Clara* (Smith, et al, 1995:96; Lawrence and Shidner, 2009:103).

In another case, the Ines de Soto site on Cuba's northern coast, though found in a harsh environment and not as well-preserved or complete, has many comparable features to *Santa Clara*. The unidentified

ship carried a wrought iron tube-gun, five versos, and harquebuses. At least one verso was loaded and ready to fire, suggesting the ship's crew was more on-guard than *Santa Clara's* (García del Pino, 1998a: 189). Early-to-middle style olive jars, similar types of majolica and other ceramic styles, and a mix of day-to-day objects show that those on board the vessel lived similarly to those on *Santa Clara*. The sizeable treasure found on the site is almost exclusively from Mexico (Díaz Gámez, 1998b: 126), indicating that though the ship was also likely riding the Gulfstream current towards Europe, it had not been on the Tierra Firme route, an idea reinforced by the presence of a Mexican obsidian blade (Escobar Guio, 1998a:209). The many silver and gold ingots and coins found on the site, along with jewelry and expensive astrolabes, suggest that the Ines de Soto ship was not salvaged after it wrecked.

Aside from comparisons to specific shipwrecks, the *Santa Clara* more generally provides vivid glimpses into Spanish and colonial Indies material culture of the early 1560's, and the realities of colonial shipboard life. With one of the largest collections of dated, sixteenth-century shipboard artillery, arms, and armour, the *Santa Clara* proves important to further defining what weapons were used at sea in the early Spanish Americas and exactly when. The same can be said for many other categories of artefacts – ceramics, day-to-day objects, and those of the ship itself. And *Santa Clara's* story, because it is associated with many significant historical figures – the great Spanish mariners Pedro Menéndez de Avilés and Esteban de Las Alas, Peruvian viceroy Lope García de Castro, Inca nobleman don Francisco Ynga Atabalipa, Costa Rican conquistador Juan Vasquez de Coronado, high-ranking official Hernando de Santillán, Peruvian aristocrat don Antonio Cabeza de Vaca, and the Venezuelan conquistador Diego Hernandez de Serpa, among others – tells of a previously unexplored event in all of their lives and offers sharper understanding of the world in which they lived. For these people, the Americas had been a presence throughout their lives, and, though exploration and conquest was still a reality for some of them, they were all making use of a well-established system designed to carry people and goods across the Atlantic. And of additional significance, because *Santa Clara* was Pedro Menéndez' ship, and it sank a mere nine months before he sailed on *San Pelayo* in June of 1565 to establish St. Augustine, Florida, the things recovered from *Santa Clara* offer one of the most direct insights into the material culture in the earliest days of the successful Spanish colonization of North America.

Work on the *Santa Clara* collection will continue. In the shorter term, artefacts from the shipwreck remain to be cleaned and analysed: There are encrusted objects yet to be conserved; many olive jar sherds to be cleaned and reassembled; iron fasteners and barrel hoop fragments to be examined; samples of stone ballast are in need of morphological and petrological study. Museum exhibits about

the ship will be developed. And, with areas of the wreck still unexcavated, there is more fieldwork that could be done. In the longer term, as time passes, new techniques and technologies will arise to allow for new ways of analysing and interpreting the materials, and fresh discoveries elsewhere will offer new ways of understanding the shipwreck. Ultimately, the materials from the *Santa Clara* will remain as an intact collection, housed in both Florida and The Bahamas, allowing the ship's story to be told and explored for generations to come.

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